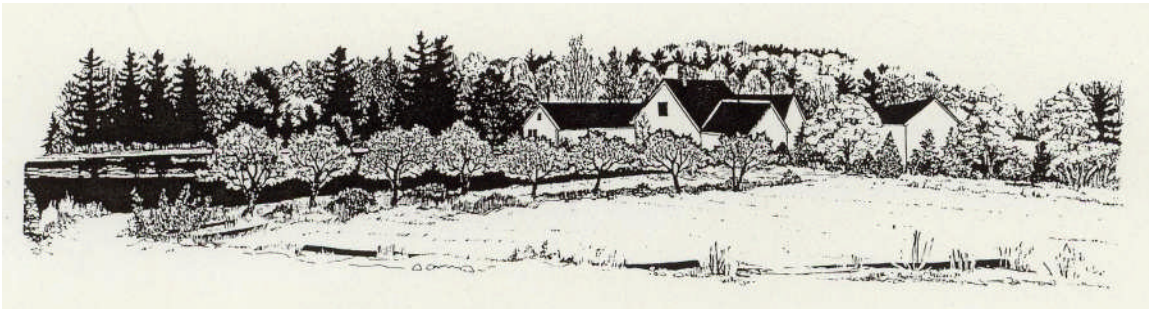


Baseline Assessment

for the

Greenough Land

November 2008



**Prepared by the
Land Stewardship Committee**

**A subcommittee of the
Carlisle Conservation Commission**



Foreword

This Baseline Assessment has been prepared by the Land Stewardship Committee (LSC), a subcommittee of the Carlisle Conservation Commission (ConsCom). The LSC, which was formed in January 2006, has a number of core tasks. Two key core tasks are to:

1. Conduct Baseline Assessments of Town-owned conservation properties; and
2. Develop a Management Plan for each of these properties.

The Baseline Assessment involves the collection, evaluation and presentation of information on several topics including:

- The acquisition of the property, including reasons for purchase, costs, funding sources, and associated land use restrictions;
- A detailed description of the property (using maps and figures, where appropriate) covering such topics as: boundaries (and abutters), major features (e.g., fields, woods, ponds, wetlands), topography, agricultural use and soil quality, trails, parking, and signs and displays;
- Historic and current uses of the property;
- A description of previous planning documents or other studies of the property;
- Maintenance activities and current condition of the property; and
- A list of issues to be addressed in the formulation of a Management Plan.

The Baseline Assessment is considered a working document and not a final published report. It is primarily designed to organize important information on a Town-owned conservation parcel in preparation for the writing of a Management Plan. It is expected that most of the information in the Baseline Assessment will eventually be used in the Management Plan which – after appropriate review – will be published in both hard copy and electronically (e.g., on the Town's web site). The Baseline Assessment itself, after review and approval by the ConsCom, will be made available in electronic format to Town committees, boards, property user groups, and the public.

Because the Baseline Assessment is a working document, no attempt has been made to make it look like a formal publication. In addition, there may be a number of errors of fact, or omission, or emphasis which we hope the review process will correct prior to the writing of the more formal Management Plan.

If you have any comments on the content of this document, please send them to Warren Lyman (warrenlyman@mindspring.com).

Cover Note: The panoramic sketch of the Greenough Pond and barn on the cover is by Carlisle artist, Phyllis Hughes. It was first used on the cover of the 1992 Greenough Land Management Plan. It is reproduced here with the artist's permission.

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1. General Description of the Property

1.1 Introduction

The Greenough Land – at 242 acres¹ – is the largest conservation parcel owned by the Town of Carlisle. Purchased in 1973 from the estate of Henry Vose Greenough, it contains an attractive combination of upland and wetland woods, a large pond and wetlands (part of the Page's Brook watershed), agricultural fields, and a barn. At the time of purchase, three other portions of the Greenough estate were sold to private parties including a 30.1 acre parcel – containing the Greenough house – that forms a peninsula of private land within the Town-owned portion. An additional portion of the estate – 8 acres in Billerica – was sold to the Carlisle Conservation Foundation (CCF).

The Greenough land is located on the eastern border of Carlisle (see **Figure 1-1**). It has frontage on both the east side (~ 2/3 mile) and west side (~ 1/3 mile) of Maple St., on Brook St. (~1/4 mile) and on the Concord River (~ 1800 ft). Two parking sites are on the Greenough Land, one each on the east and west sides of Maple Street, both having room for 8 – 9 cars.

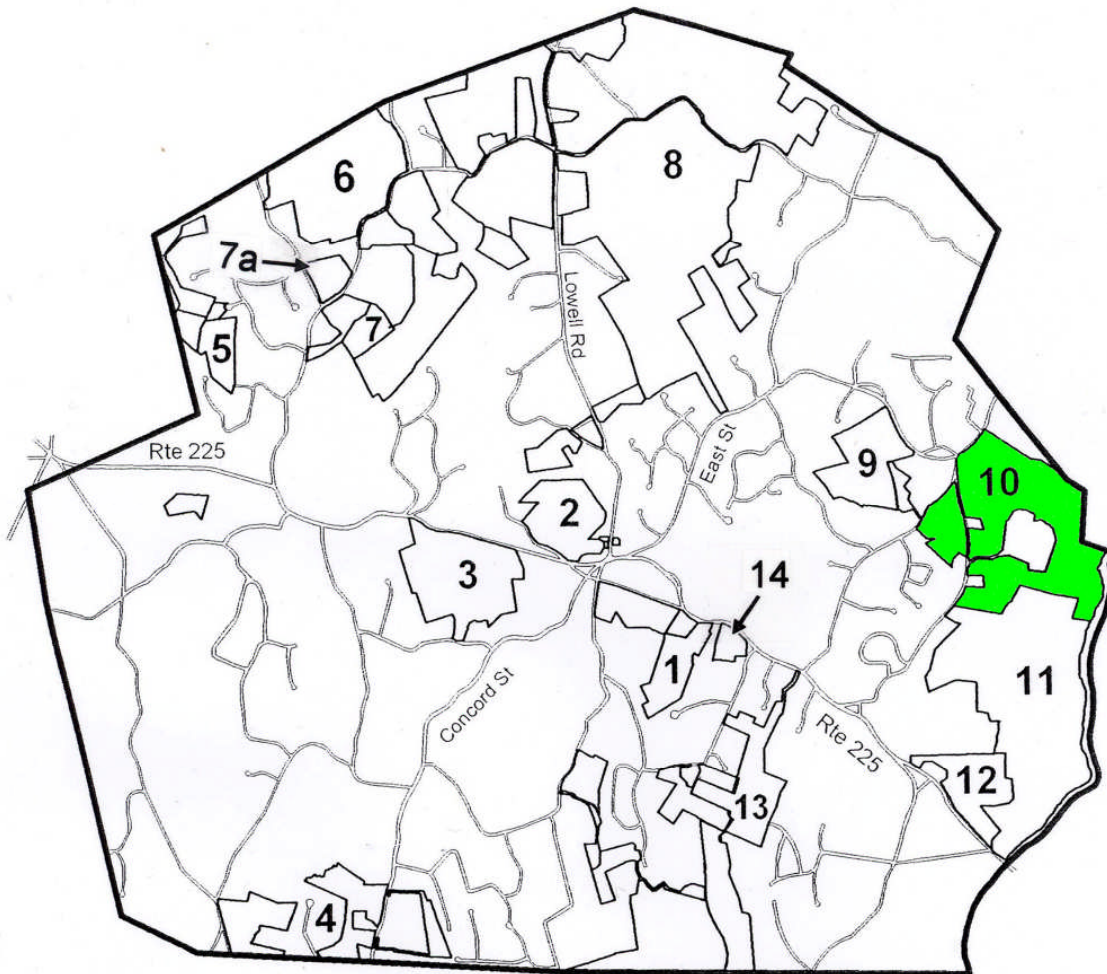
One outstanding feature of the Greenough Land is that it abuts, or connects to, a significant amount of other conservation land owned by either the Town (Heidke, Foss Farm and Town Forest), the Federal government (Great Meadows National Wildlife Refuge [GMNWR]), the CCF (2 parcels), or by private parties (Workum conservation restriction). The total area of the eight contiguous parcels (including Greenough) is approximately 742 acres. (See details below.) This total excludes land on the east side of the Concord River in Bedford. This large conservation cluster affords not only an extended habitat for a diversity of wildlife, but also an extended trail system linking three of the larger parcels.

1.2 Abutters

Abutting or Nearby Conservation Lands

The abutting or nearby (and linked) conservation lands are listed in **Table 1-1**. The locations of these parcels are shown in **Figure 1-2**. (Map #s in Table 1 correspond to the #s in Figure 1-2.) As shown in Table 1-1, there are 364.6 acres of contiguous conservation lands and an additional 122.2 acres of linked conservation lands. These values, when added to Greenough's 255 acres, yield a combined conservation parcel of about 742 acres.

1. Carlisle's *Open Space and Recreation Plan - 2005* (January 2006) lists the size as 255 acres. However, no data are available to support this value. At the time of purchase, most documents – based on information in the deed to the Town (likely relying on a 1931 survey: see Sect. 2) - indicated the parcel was 242 acres. This is consistent with an estimate of 241.1 acres obtained by a computer program that calculates the area inside of a property boundary drawn on a computerized map.



- | | |
|---|----------------------------------|
| 1 Banta Davis | 7a Hutchins Field |
| 2 Conant Land | 8 Great Brook State Park |
| 3 Towle Land | 9 Town Forest |
| 4 Bisbee and Benfield Lands,
& Spencer Brook Reservation | 10 Greenough Land |
| 5 Carlisle Pines State Forest | 11 Great Meadows NWR |
| 6 Cranberry Bog | 12 Foss Farm |
| 7 Curve St. Conservation Lands | 13 Davis Corridor & Malcolm Land |
| | 14 Fox Hill |

Source: Modified from Carlisle's 2005 Open Space and Recreation Report

Figure 1-1. Locus Map for Selected Conservation and Recreation Properties in Carlisle

Table 1-1. List of Abutting, or Nearby and Linked, Conservation Lands

Abutting Lands				Nearby (and Linked) Lands			
Map #	Name	Owner	Acres	Map #	Name	Owner	Acres
12	GMNWR	US DOI	321	7	Town Forest	Town	67
8	Heidke	Town	8.19	13	Foss Farm	Town	55.2
11	Pages Brook Res.	CCF	6				
10	Billerica Res.	CCF	8				
CR-30	Workum CR#30	private	21.4				
Total:			364.59	Total:			122.2

Notes:

Map #s correspond to the numbers in Figure 1-2.

GMNWR = Great Meadows National Wildlife Refuge

US DOI = US Department of the Interior

CCF = Carlisle Conservation Foundation

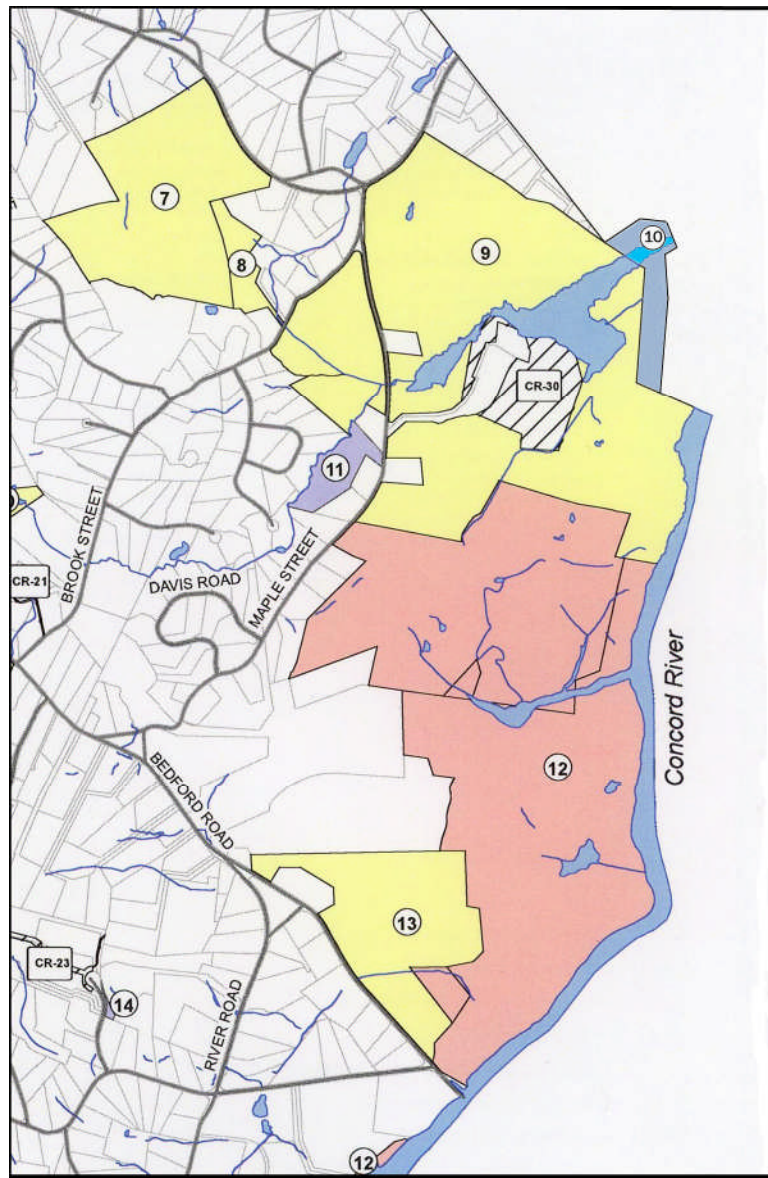
CR = Conservation Restriction (permanent)

Res. = Reservation

The most significant of the abutting protected lands is the GMNWR, managed by the US Fish and Wildlife Service (US Department of the Interior). The portion of the GMNWR shown in Figure 1-2 (321 acres) is only a fraction of the whole GMNWR which consists of 3,600 acres – including significant freshwater wetlands – stretched along 12 miles of the Concord and Sudbury Rivers. The US Fish and Wildlife’s interests in expanding the GMNWR led to their proposing, in 2002, to take over ownership and/or management of the Greenough property. Additional information on the GMNWR is available online (www.fws.gov/northeast/greatmeadows).

Another significant abutting conservation land is the Workum Conservation Restriction (CR#30) which essentially surrounds the two-lot peninsula of private land within the Town’s Greenough Land. The CR was granted to the Town of Carlisle on December 16, 1994 by Fifield Workum, Jr. and Susan Workum who were, at the time, residents of the former Greenough house (528 Maple St.). The land that is now protected was part of the original Greenough estate and contains significant wetland and agricultural lands. The common border between CR#30 and the Greenough Land is approximately 4,255 feet (0.806 miles) long. Additional details on this CR are provided in **Appendix A** of this Baseline Assessment and in the CR#30 file maintained in the Conservation Commission’s office in Town Hall.

As noted in Table 1-1, two of the abutting conservation parcels are owned by the Carlisle Conservation Foundation (CCF). The one in Billerica was originally a part of the Greenough estate; it was purchased by CCF in 1973 – at the same time as the Town’s purchase – as it was deemed inappropriate for one town to own land in another town. Pages Brook Reservation was acquired in 1966.



Legend

- Roads
- ~ Streams
- ☪ Ponds
- ▨ Conservation Restriction
- ☐ Carlisle Conservation Foundation
- ☐ Town of Carlisle - Conservation Commission
- ☐ United States of America
- ☐ Parcels, revised to January 1, 2004

See Table 1-1 for parcel names corresponding to numbers in Figure.

Figure 1-2. Abutting and Linked Conservation Parcels

Other Abutting Lands

Excluding conservation lands, and lands in Billerica, there are approximately 24 private lots, on either Maple, Brook or Carlisle² Streets, that directly abut the Greenough Land. This includes the two lots in the peninsula of private land within the Greenough Land. **Figure 1-3** shows the location of these lots. A list of these abutters has been prepared and placed in the Conservation Commission files in Town Hall.

A significant portion of the eastern boundary of the Greenough Land (~ 1,800 ft) is in the middle of the Concord River. (Note that not all of the maps in this document show it as such.) Land on the other side of this boundary is in the Town of Billerica. Most of that land – on the east bank of the Concord River - is part of the GMNWR, but a small portion, with river frontage, remains private.

1.3 Access

As shown in **Figure 1-4**, the Greenough Land can be accessed from about ten trailheads on public land, two of which have parking lots holding 8 - 9 cars each. One parking lot is on the west side of Maple Street and the other on the east side. Six trailheads allow access from Maple Street, one from Brook Street, and one from the intersection of Brook and Maple Streets. Two trails allow access to the southern part of the Greenough Land from the Great Meadows National Wildlife Refuge.

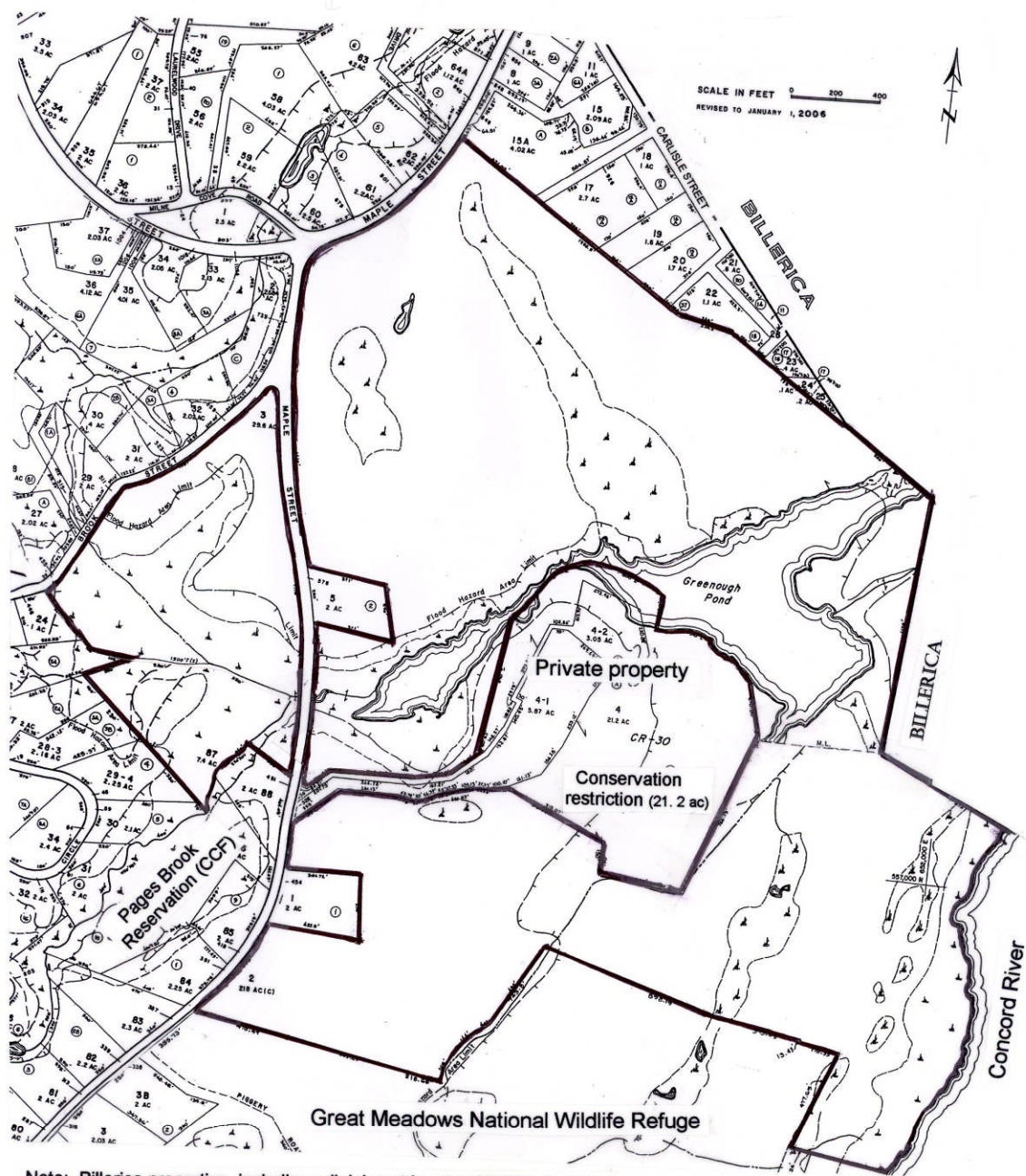
In addition, the land surrounding the eastern tongue of Greenough Pond in Billerica can be legally traversed, on the trail provided, due to an easement granted by the Carlisle Conservation Foundation (CCF) to the inhabitants of the Town of Carlisle, acting through its Conservation Commission. This easement thus allows access from CCF's conservation land in Billerica. A copy of the legal document granting the easement is provided in **Appendix B**.

In 1992, Fifield Workum, Jr. and Susan Workum granted to the Town of Carlisle an easement over the road from Maple Street (common driveway for 528 and 536 Maple St.) down to the area of the barn and former Life Estate. A copy of the legal document granting the easement is provided in **Appendix C**. Access is not granted to the general public. The specific wording is:

“This easement may be used by employees or agents of the Town carrying out their duties and responsibilities, and by lawful tenants on property owned by the Town. The Town may take necessary and appropriate actions to repair and maintain the existing driveway for safety reasons....”

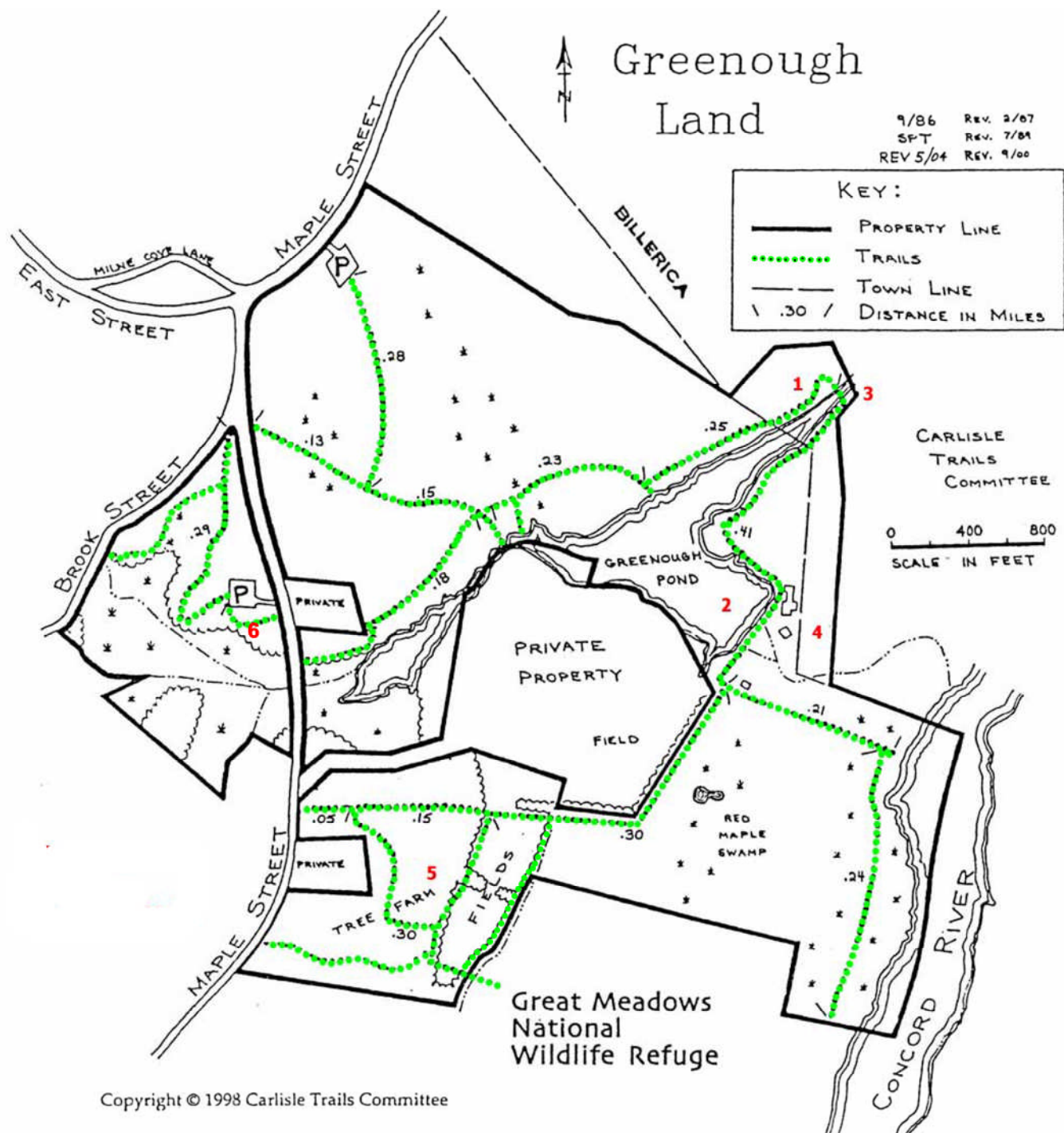
At present, vehicle access via the above-described easement is physically blocked at the Greenough Pond dam due to partial deterioration of the dam which makes vehicular traffic unsafe.

2. Carlisle Street is partly in Billerica but has several properties that are, in whole or in part, in Carlisle. This residential area is commonly referred to as Queensland.



Note: Billerica properties, including adjoining strip owned by the Carlisle Conservation Foundation, are not shown in this Figure.

Figure 1-3. Property Map for the Greenough Land



1. Land in Billerica owned by the Carlisle Conservation Foundation
2. Greenough Pond
3. Footbridge (part of trail) over Pond
4. Greenough barn and cottage
5. Grove of Red and White Pines
6. Warming hut for skaters

Figure 1-4. Features and Trails of the Greenough Land

In 1972, the CCF, owners of the abutting 8-acre conservation parcel in Billerica, voted to give the Town of Carlisle limited access to the area of the barn and former Life Estate. CCF specifically voted:

“...to grant permission to the Town of Carlisle, through its Conservation Commission, on request, to pass over a woods-road for access between Pauline Road, Billerica, and the above-mentioned Parcel C, for maintenance purposes, this permission being revocable at will by the Foundation.” (Motion voted at a Special Meeting of the Trustees on October 2, 1972.)

It should be clear from the above that the general public has no legal vehicular access across CCF land to the area of the barn and former Life Estate.

1.4 Major Features

The major features of the Greenough Land – excluding man-made structures - include the following:

- Largest Town conservation property (242 ac)
- Abuts or links to other conservation lands (~ 487 ac) forming a large conservation cluster (total of ~ 742 ac) (See Section 1.2 above.)
- Significant trail system on site and with links to other conservation lands
- Largest pond in Town: Greenough Pond (~ 21 ac)
- Page’s Brook and associated wetlands (discharge to the Concord River)
- Frontage on the Concord River (~ 1,800 feet)
- Vernal pools; 3 certified. (Discussed in Section 4.)
- Upland hardwood and pine forests (~160 ac), including a pine plantation; red maple swamp
- Agricultural fields (~4 ac) used for hay and corn by lessee farmer. (See Section 4.)
- Large rock formations (in the upland areas)

In addition there are a few man-made structures that are significant features:

- A large animal barn (a part of the original Greenough estate)
- A warming hut (more a lean-to) for skaters (west side of Maple St.)
- Remnants of other farm buildings (hen and turkey houses, piggery, tool shed, corncrib, woodshed) and drainage ditches
- Numerous stone walls
- The Greenough Pond dam
- Numerous Wood Duck houses in Greenough Pond and upstream wetlands

In 2007, a farmer’s cottage and greenhouse were torn down as they were in poor condition. They were located just to the south of the animal barn. A chain link fence that was behind the greenhouse remains.

The locations of many of these features were shown in Figure 1-4. Many of these features can also be seen in the aerial photo of the site (**Figure 1-5**). A 1971 aerial photo in Town Hall clearly shows the remnants of the farm buildings (listed above) which are now mostly fallen down and/or hidden by brush and trees. (See also Figure 3-1 in Sect. 3.)

Some of the features listed above are described below. For several, further information is provided in Sections 4 or 5, and/or in **Appendix F** (Site Photos). Other aspects of the natural features of the Greenough Land such as topography, water features, and wetlands are described in more detail in Section 1.7 below.

Most of the Greenough Land is to the east of Maple St. However, to the west (between Maple St. and Brook St.) a section of the Greenough property lies athwart a wetland and pond that is fed by Pages Brook and an unnamed stream that meet at the pond. The pond has been used as a skating area. A warming hut was built on the north shore of the pond soon after the land was acquired by the town. There is a parking lot, accessible from Maple Street, adjacent to the hut.

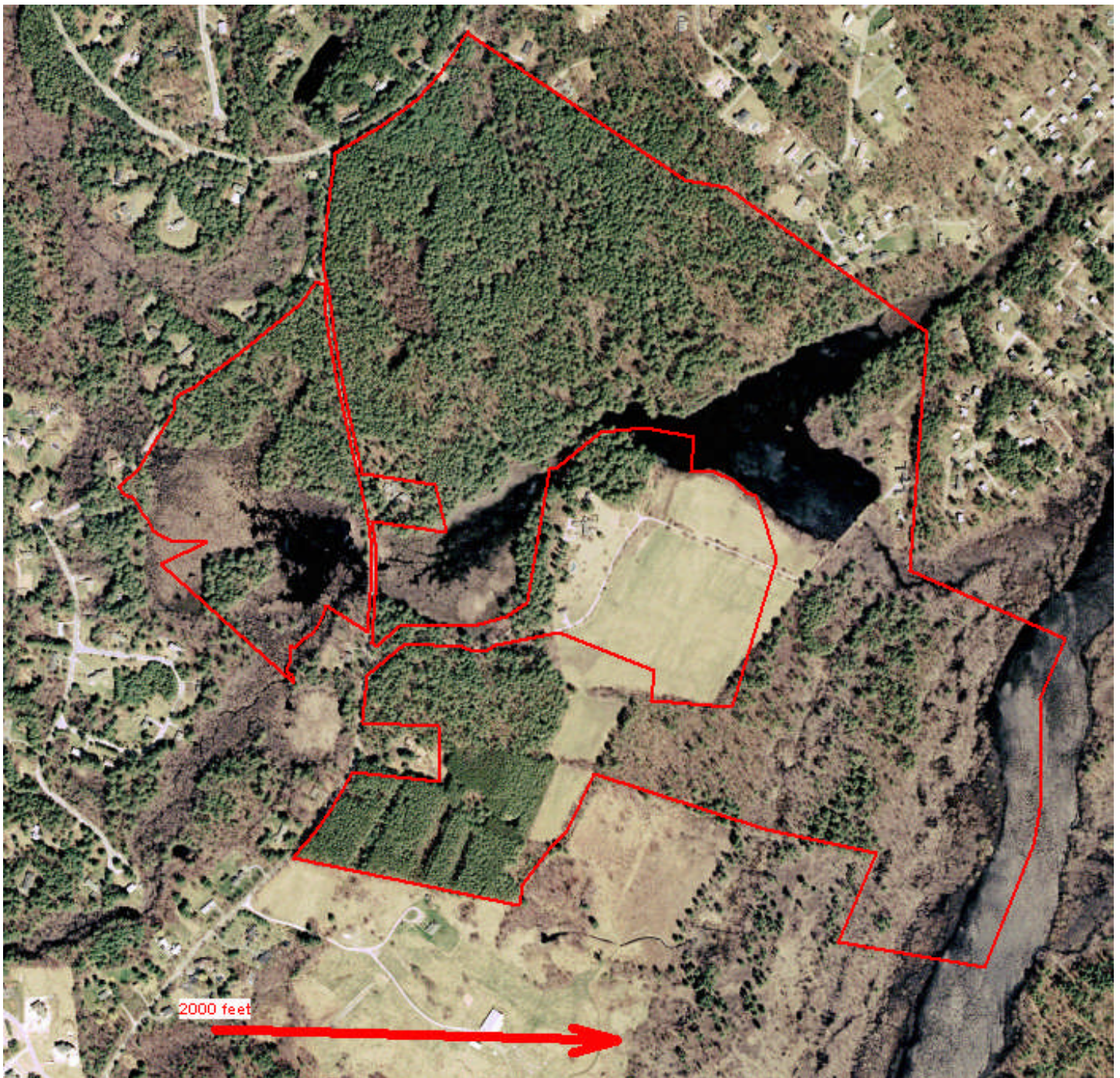
A trail starts near the hut and goes west along the northern shore of the pond. Another trail goes north parallel to Maple Street. It can be accessed at the north end of the property from Maple Street. This trail connects to a trail that winds over the hilly area to Brook Street. The Brook Street entrance is just north of the stream and its bridge. None of these trails are marked but the use wear is obvious enough so that they are easy to follow. There are several short branch trails as well.

Although this part of the property is not large, it is interesting in that it combines rugged ledge filled uplands with ponds and wetlands in a compact area. Walking the trails is a pleasant and interesting experience.

There are some noteworthy features on this part of the Greenough property. What appear to be Indian ceremonial structures are located in the upland ledges and along Maple Street. A relatively mature American chestnut tree has been seen not far from the trail that skirts the pond.

Trails

As shown in Figure 1-4, there is an extensive trail system available on the Greenough Land. The trails total about 4 miles, including a small segment that passes around the eastern tongue of Greenough Pond in Billerica (on land owned by the Carlisle Conservation Foundation [CCF]). Trailhead parking is available at two locations on Maple St. Some of the trails were created after purchase by the Town; others use old farm roads that existed at the time of purchase and are suitable for horseback riding. As noted above (and shown in the Trail Committee's *Trails in Carlisle*) two trails provide access to the Great Meadows National Wildlife Refuge (GMNWR) and – after passing through GMNWR – to Foss Farm on the south side of the GMNWR.



Notes: 1) Property boundary shown in red. Boundary line locations shown are approximate.
2) Red arrow (for scale) is 2000 feet long.
3) Photo date: 2001 (published in 2005).

Figure 1-5. Aerial Photo of Greenough Land

Along the trails are a diversity of habitats and vistas, including woodlands, agricultural fields, Greenough Pond and the wetlands of Pages Brook. The trail segment passing through the CCF-owned parcel in Billerica has a substantial footbridge to allow passage over the eastern tongue of Greenough Pond. The bridge was designed and built – at a cost of \$402 - in 1975 by Associate Conservation Commissioner James F. Davies. Significant reconstruction of the bridge was undertaken in 1996 by a scout group. As noted in Section 1.3 above, CCF has granted to the inhabitants of the Town of Carlisle the right to use the trail on their land. (See Appendix B.)

A portion of the Greenough Land trails, primarily those in the southeastern portion (especially near the Concord River), have flooded sections during high water periods. Much of this land is within the Town's flood hazard district (below 120 ft elevation – see Figure 1-9).

The Trails Committee has placed several trail signs throughout the Greenough trail system. Most direct the public to the desired destination, while others just indicate a trailhead or trail intersection, or warn of abutting private property to be avoided. In addition, some trails are marked along the way either with a red paint blaze or a blue and silver disc with a hiker symbol. The signs, in conjunction with the Committee's guide, *Trails in Carlisle*, make it fairly easy for newcomers to find their way.

Greenough Pond and Dam³

The Greenough Pond and dam are part of the Pages Brook watershed. The drainage area upstream of the pond is about 4.0 square miles. The brook empties into the Concord River about 1000 feet downstream of the dam. Greenough Pond (~ 21 acres) is the largest pond in Carlisle. It has a typical storage capacity of 45 acre-feet (maximum: 80 acre-feet). The above data imply an average depth of only 2.1 feet. According to the Federal Emergency Management Agency's Flood Insurance Study (FIS) of May 1988, flows influent to the pond during the 50- and 100-year floods are 286 cubic feet per second (cfs) and 349 cfs, respectively. The corresponding discharges from the pond were estimated by Stephens Associates (2004 [cited in footnote 3 above]) to be 195 cfs and 251 cfs, respectively. It has been suggested that the pond was created by Mr. Greenough to provide habitat for water fowl. According to a long-time local resident, at times of high water in the past, the Greenough Pond also discharged through the eastern tongue in Billerica, with water high enough to paddle a canoe through. Today, the pond level, due to missing flashboards in the dam, likely does not reach the height necessary for such outlet flow. What flow that is seen at present in the eastern tongue is all into the pond.

The Conservation Commission's Rules and Regulations specifically allow fishing, ice fishing, canoeing, and skating on the pond. However, the walk-in requirements (~ ½ mile from Maple St.) significantly restrict these activities, especially canoeing. The pond is a significant habitat for waterfowl. Several wood duck houses exist on the pond; they are

3. Most of the data in this section is taken from the 2004 report by Stephens Associates: *Report of Dam Engineering – Greenough Pond Dam, Carlisle, Massachusetts*, prepared for the Town of Carlisle.

maintained by the Massachusetts Department of Fish and Wildlife.

The Greenough Pond dam is an earthen embankment approximately 500 feet long and 10 feet high with two concrete box spillways. A dirt road follows along the top of the dam providing access (from Maple St.) to the barn and former Life Estate area. The dam was reportedly constructed in the early 1930s. It appears on a July 1931 Plan of Land (for the Greenough property) prepared by F. Tuttle, surveyor. Since at least 1984, the proper functioning and integrity of the dam have been of concern and have led to State inspections, studies, remedial plans, and some remedial actions. (Full details are provided in Section 4.) The main problems have been during high waters when the dam has been topped, and – after 1984 – breached on more than one occasion. One remedial action has been to remove the trees and bushes growing in the dam which were thought to lead to weakening of the dam. Because of deterioration in the dam, it is now closed to vehicular traffic.

According to criteria established by the Department of Environmental Management (DEM) Office of Dam Safety's Rules and Regulations, the dam is classified as an **Intermediate** size dam. In addition, based on the lack of any downstream development (on Pages Brook) and the modest storage capacity of the pond, the hazard potential of the site is classified as **Low**.⁴ DEM regulations (302 CMR 10.00) require the dam to be inspected by a professional engineer at least every 10 years.

Wood Duck Nesting Boxes

Wood duck nesting boxes have been on the Greenough Pond and upstream wetlands starting when Mr. Greenough still owned the property (i.e., prior to 1973). At some point in time, the Massachusetts Division of Fisheries and Wildlife (MassWildlife) took over maintenance and oversight of the boxes. As of spring 2007, there were 33 wood duck nesting boxes on the Greenough Land, and hundreds more on over 200 other sites in the State, all managed by MassWildlife. The boxes are usually checked twice a year, and records are kept on the use by wood ducks and hooded mergansers. Use data for the Greenough Land are available as far back as 1979. Some of the data are presented below in Section 4.3. The Greenough Land is sometimes used by MassWildlife for special studies related to wood ducks.

Agricultural Fields

The Greenough Land has approximately 4 acres of land in agricultural use.⁵ Town records of such use only go back to 1992, but the land likely has been in such use much longer. While under Town ownership, the fields have been leased to a succession of local farmers. Mark Duffy, the State's dairy farmer at Great Brook State Park leased the fields in 2005 and 2006. Prior farmers included Gerry Cupp of Concord (1999 – 2004) and

4. DEM Notice of Inspection to Town of Carlisle, October 17, 2000.

5. A map(GIS)-based estimate of all Town-owned agricultural land on the Greenough property yields 5.1 acres. It appears that about 1 acre of the agricultural land is more closely connected to the abutting private conservation restriction, and is – therefore – difficult for the Town's licensee farmer to use.

Thomas O'Rourke of Maple St. in Carlisle (1992 [or earlier] – 1997). Until recently, hay has been grown; corn was grown in 2006-07. In 2006, Mr. Duffy was also allowed to lease the fields on the adjacent private fields held under a conservation restriction (CR #30). Additional details on the agricultural use of the land are provided in Section 1.3.

Information on the soils in these fields is provided in Subsection 1.8 below.

Barn and Other Nearby Buildings

At the time of purchase, the Greenough property had a large barn, several smaller farm buildings, and a house (commonly called the “farmer’s cottage” or the “cottage”) on the east side of the pond near the Billerica border (see **Figure 1-6 and 1-7**). The smaller farm buildings included a greenhouse, piggery, hen and turkey houses (**Figure 1-8**), corncrib, tool shed, and others of unknown use. The buildings are clearly seen in a 1971 aerial photograph (available in Town Office). (See also Figure 3-1 in Section 3 for building locations.) No information is available on the dates of their last use (certainly before 1972). Today, only the barn is potentially useful, but in need of significant repairs. The remaining buildings have deteriorated to the point of uselessness or torn down. In late 2007, the cottage and greenhouse were demolished by the Town as they were considered a hazard. The cottage was occupied up until about 1997 by Alfred and Elizabeth Windhol who had been caretakers and farmers for Mr. Greenough. (The basis for use, and conditions, of their cottage use are further described in Sections 2 and 3.) The barn was used for a period (~1998 to 2007) as a workshop and storage area by Paul Booth. (See Section 3 for more details.) New uses for the barn are currently being evaluated. (See Section 5.)

The Greenough barn is quite large, extending over 140 feet in the north-south direction (not including a 25-foot covered trench for manure collection) and over 75 feet in the east-west direction. Excluding an attic over part of the north end of the barn, the building has 13 interior rooms, some subdivided by partitions or fences into animal stalls or storage areas. The flooring in almost all areas is cement. A schematic diagram of the Greenough Barn floor plan is given in **Figure 1-9**; individual rooms are designated by letters (A-N). In the large barn-like room in the center of the building (room F), there is a hay loft (~ 17 feet up) in the central part of the room (between the posts); from the floor to the roof peak is ~ 34 feet. Portions of the floor on the sides of the room, including room G, are raised (wood). An overhead trolley track is in rooms H, L and J, and was likely used to transport manure to the covered trench area (room N). Room K contains feed bins along the east wall. Other rooms contain storage cabinets, shelves and workbenches (rooms A, C & H), or furniture (room B: loft). As of an inspection on May 31, 2007, there were still a substantial number of junk items which need to be removed from the building. Figure 1-6 does not show the full extent of the 10-foot wide roofed trench (room N) which extends 24 ½ feet from the north end of the barn. The bottom of the trench is about 2 ½ feet below grade. At the end of the trench, a 10-foot ramp leads to grade. Near the north-west corner of the covered trench is a circular cement cover (~ 3 feet diameter) which may cover a cistern.



Figure 1-6. Greenough Barn (1972)



Figure 1-7. Farmer's Cottage (foreground) and Greenhouse (1972)



Figure 1-8. Chicken and Turkey Coops (1972)

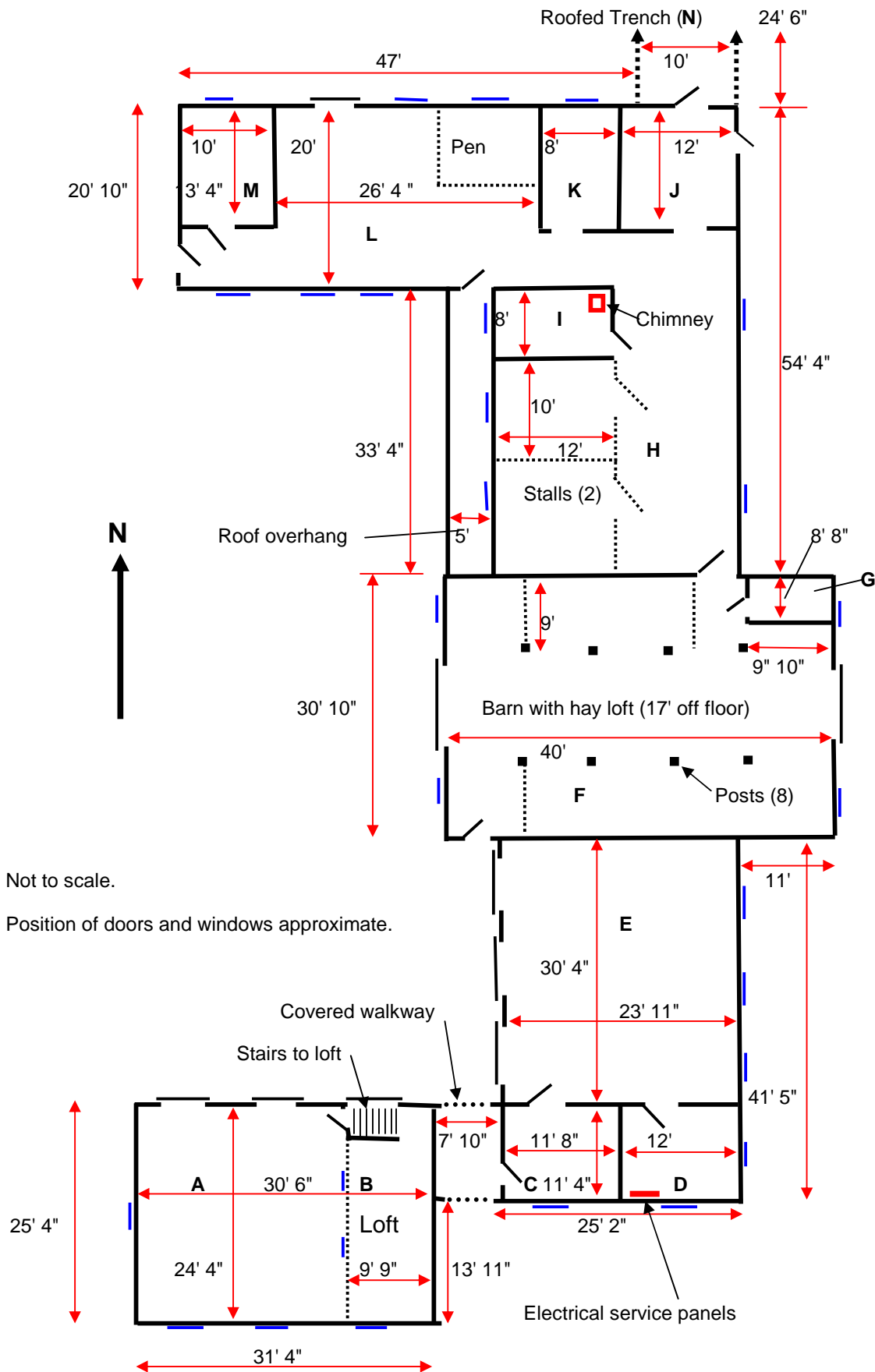


Figure 1-9. Schematic of Greenough Barn Ground Floor Plan

Warming Hut for Skaters

In 1974, Associate Conservation Commissioner James F. Davies designed and built a warming hut for skaters near the shore of a wetland area on the west side of Maple St. (See Figure 1-4. See Appendix F for photo.) Today, it is little used by skaters, but occasionally – based on trash at the site - for beer parties.

1.5 Importance of Major Features

The features described above demonstrate that the Greenough Land is a very significant conservation holding for Carlisle, providing:

- Preservation of a large, relatively undisturbed, parcel and associated cultural heritage features (barn, agricultural fields, stone walls, etc.);
- An extensive trail system with links to other abutting conservation parcels which allow long, peaceful walks;
- An opportunity – little used at present – for water-based recreation (on Greenough Pond) such as fishing, canoeing and skating.
- A diversity of terrain and wildlife habitat, including upland woods (pine and hardwood), a large pond, a brook and associated wetlands, river frontage and associated wetlands, and vernal pools.

The Greenough Land also adds an important supplement or buffer –with habitat for migrating birds - to the Great Meadows National Wildlife Refuge.

The buildings on the Greenough Land have – to date – provided more maintenance and oversight problems than they have opportunities for public use.

1.6 Signs and Displays

A large wood property sign (property name only) exists at the corner of Maple and East Streets. In addition, there are two large (wood) conservation land signs, with a listing of allowed uses, at the south and north parking lots. At the north parking lot there is also a kiosk, in good condition, containing various property maps. There are a total of five of the standard (metal construction) conservation signs, with a listing of allowed uses, posted at most (but not all) trail entrances to the Greenough Land from Maple St. and the Great Meadows National Wildlife Refuge. Additional details are provided in Section 5. Photographs are provided in Appendix F.

On the south side of the eastern tongue of Greenough Pond, there is a granite post marking the Carlisle-Billerica border. The letters “C” and “B” are caved into the post on the appropriate sides of the post. (See photo in Appendix F.)

As noted in Section 1.4 above, there are also numerous trail signs erected by the Trails Committee. Most mark trailheads or trail intersections; two mark abutting private property. (See Appendix F for photos.)

A sign has been erected in the middle of the dirt road near the southwestern end of the Greenough Pond dam stating that no motor vehicles are allowed. (See photo in Appendix F.) In late 2007, after an illegal fire pit was found on the north shore of Greenough Pond, a special warning sign (laminated paper) was placed at the site, and a standard conservation sign listing allowed and prohibited uses (laminated paper) was placed on the nearby trail visible to hikers coming from Billerica.

1.7 Regional Topography, Surface Waters, and Wetlands

Topography

Figure 1-10 shows the topography of the Greenough Land. Generally, with the exception of some wetlands (including vernal pools) the land to the north of Greenough Pond and Pages Brook, and east of Maple St., is relatively high and contains some interesting topographic variability. The variability includes high points up to about 150 ft elevation, with several irregular rock outcrops. One other area with some relative elevation occurs in the southwest corner of the property (up to ~ 45 m/148 ft). The property south and east of Greenough Pond is relatively flat and slopes to the Concord River. The portion of the Greenough Land west of Maple St. is quite flat, with a significant fraction being wetlands.

Data provided below in Subsection 1.8 (Soils) indicate that lands on the Greenough Land (i.e., not counting surface waters) have the following slope ranges:

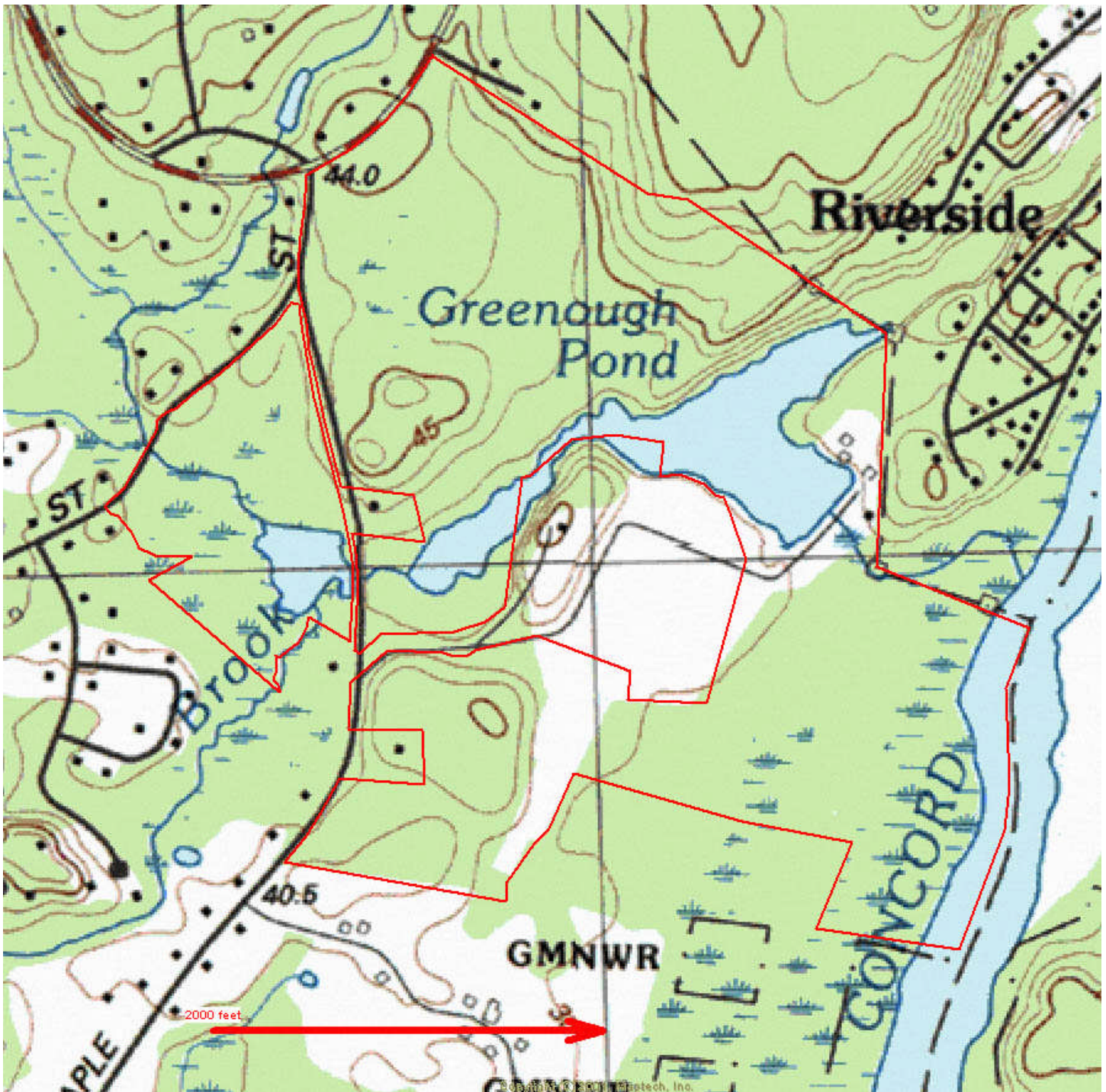
- 42% of the property has slopes of 0 – 3% (for a portion the range is 0 – 2%)
- 25% of the property has slopes of 3 – 8% (for a portion the range is 2 – 8%)
- 22% of the property has slopes of 8 – 15%
- 2% of the property has slopes of 15 – 25%

Surface Waters and Wetlands

The Greenough Land contains a significant amount of both surface waters (~ 23.6 acres⁶, including Greenough Pond) and wetlands (~ 120 ac). As mentioned previously, the Greenough Pond, the two upstream surface water areas, and the interconnecting Pages Brook are the main surface water bodies on the property (not counting the Concord River).

Two different depictions of the surface waters and wetlands are provided in **Figures 1-11** and **1-12**. Figure 1-11, prepared by the Westford District Office of the Natural Resources Conservation Service, shows wetlands over-mapped by four different types of swamps: shrub, wooded/coniferous, wooded/deciduous, and wooded/mixed trees. The irregular polygon in the middle of Figure 1-11 (and also Figure 1-13) shows the location of the agricultural fields that are part of the Greenough Land. Figure 1-12 is from the Town GIS system (Assessors Maps) which show both wetlands and flood areas (here, land below the 120-foot elevation).

6. This value comes from the data in Table 1-2 presented in Section 1.8 below.



- Notes:
- 1) Property boundary shown in red. Boundary line locations shown are approximate.
 - 2) Black dashed line is Town boundary with Billerica.
 - 3) Elevations in meters. Contour intervals are 5 meters.
 - 4) Red arrow (for scale) is 2,000 feet long.
 - 5) Topo base map date: 1987.

Figure 1-10. Greenough Land Topography

Greenough Land

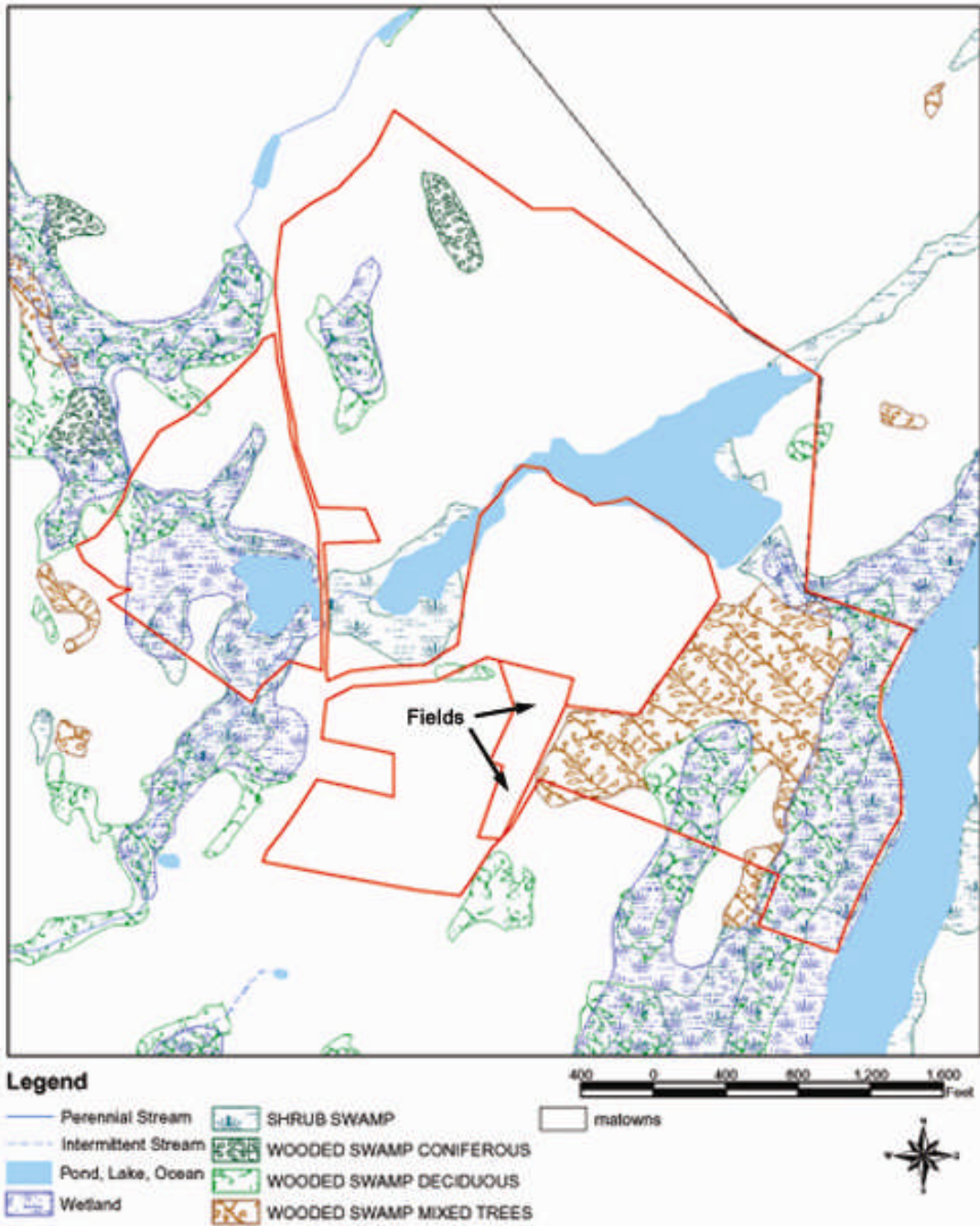
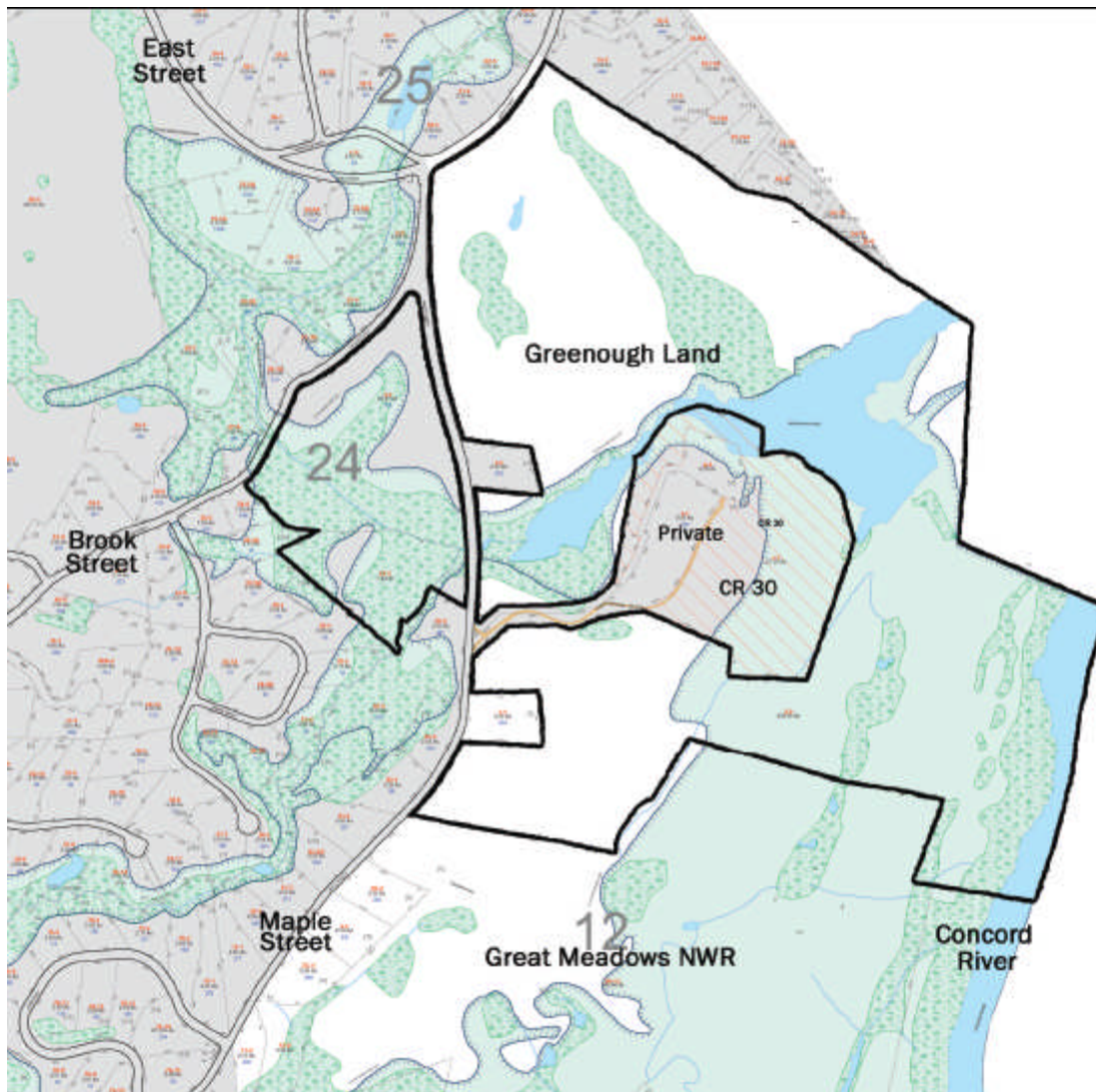


Figure 1-11. Greenough Land Water Features



Legend

— Parcel boundary	Ponds
- - - Parcel boundary - common ownership	Flood Hazard
— Right of Way	Wetlands
- - - Misc easement	Wetland/Flood Area
- - - Utility easement	Conservation Restriction Area
- - - Trail	Adjacent map sheet
— Stream	[26K] Development Lot number
Common Driveway	77-E5 Block - Lot number
Common Driveway Easement	2.00Ac Area in acres. Source: Assessors CAMA database
	124 Street address number. Source: Assessors CAMA database

Note: Lot lines are as of January 1, 2004

Figure 1-12. Town-Mapped Wetlands and Flood Areas

1.8 Soils

Based on a Natural Resources Conservation Service study⁷ there are 24 classifications of soils on the Greenough Land. This is comprised of 15 basic soil types, some being further classified into subgroups based on the slope of the land. These soils are listed in **Table 1-2** along with the approximate acreage covered and certain soil characteristics. The locations of the soils are shown in **Figure 1-13**; the map legend is on the following page. Most of the soils are described as loamy sand or sandy loam. The approximate outline of Greenough fields is shown by the yellow line in the south-central portion of the property; the soils in the fields are mostly Deerfield loamy sand (code 256A). A full description of each soil type is provided in **Appendix D**.

The Land Capability Classification of each soil (listed and explained in Table 1-2) shows, in a general way, the suitability of soils for most kinds of field crops. The soils present on the Greenough Land have a wide range of class definitions (II to VII) which cover, respectively, a range of moderate to severe limitations for successful cultivation in the soils. Subclass codes (“e”, “s” or “w”) further describe any limitations on cultivation. Capability class II-e would, for example, be defined (per the notes in Table 1-2) as:

“Soils have moderate limitations that reduce the choice of plants that require moderate conservation practices. Soil is mainly limited by risk of erosion unless close-growing plant cover is maintained.”

The NRCS study also gives a farmland rating to soils of generally high quality. The rating is either “Prime” or “Locally Important”. As indicated by the data in Table 1-2 and Figure 1-9, the cultivated fields on the Greenough Land are considered Locally Important. Soils in a few other areas on the property are considered Locally Important or Prime. One of the areas with Prime soils is now part of the pine plantation (code 254B). Prime farmland is defined, in part, as follows:

“Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, forest land, of other land, but not urban built-up or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to accepted farming methods.” (Footnote 7)

7. Middlesex County [MA] Interim Soil Survey Report, 4th Edition, July 1995. Prepared by the US Dept. of Agriculture, Natural Resources Conservation Service. Published by the Middlesex Conservation District.

Table 1-2. Greenough Land Soils and Their Characteristics

Map Unit Symbol, Soil Name, Slope	Acres ¹	Percent	Land Capability Classification ²	Farmland Rating ³
1 Water	23.6	10%		
103B Charlton-Hollis-rock outcrop complex, 3-8% slope	11.4	5%	VII-s	
103C Charlton-Hollis rock outcrop complex, 8-15% slope	20.1	8%	VII-s	
253B Hinckley loamy sand, 3-8% slope	7.3	3%	III-s	Important
253C Hinckley loamy sand, 8-15% slope	5.5	2%	IV-s	
253D Hinckley loamy sand, 15-25% slope	3.7	2%	VI-s	
254B Merrimac fine sandy loam, 3-8% slope	5	2%	II-s	Prime
255A Windsor loamy sand, 0-3% slope	5.2	2%	III-s	Important
255B Windsor loamy sand, 3-8% slope	11.8	5%	III-s	Important
255C Windsor loamy sand, 8-15% slope	0.3	0%	IV-s	
256A Deerfield loamy sand, 0-3% slope	16.3	7%	III-w	Important
259B Carver loamy coarse sand, 3-8% slope	3.3	1%	IV-s	
260B Sudbury fine sandy loam, 2-8% slope	1.2	0%	II-e	Prime
307B Paxton fine sandy loam, extremely stony, 3-8% slope	3.1	1%	VII-s	
307C Paxton fine sandy loam, extremely stony, 8-15% slope	9.6	4%	VII-s	
312B Woodbridge fine sandy loam, extremely stony, 3-8% slope	3	1%	VII-s	
32B Wareham loamy fine sand, 0-5% slope	6.4	3%	IV-w	
36A Saco mucky silt loam, 0-2% slope	9.5	4%	VI-w	
422B Canton fine sandy loam, extremely stony, 3-8% slope	13.4	6%	VII-s	
422C Canton fine sandy loam, extremely stony, 8-15% slope	18.4	8%	VII-s	
424B Canton fine sandy loam, extremely bouldery, 3-8% slope	1.4	1%	VII-s	
51A Swansea muck, 0-3% slope	8.9	4%	VII-w	
52A Freetown muck, 0-3% slope	11.6	5%	VII-w	
53A Freetown muck, ponded, 0-3% slope	16.8	7%	VII-w	
8A Limerick silt loam, 0-3% slope	25	10%	IV-w	
Total:	241.8			

Notes:

1. Acreage is approximate as exact property boundaries were not used.

2. **Class Definitions**

- II. Soils have moderate limitations that reduce the choice of plants that require moderate conservation practices.
- III. Soils have severe limitations that reduce the choice of plants or that require moderate conservation practices.
- IV. Soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.
- VI. Soils have severe limitations that make them generally unsuitable for cultivation.
- VII. Soils have very severe limitations that make them unsuitable for cultivation.

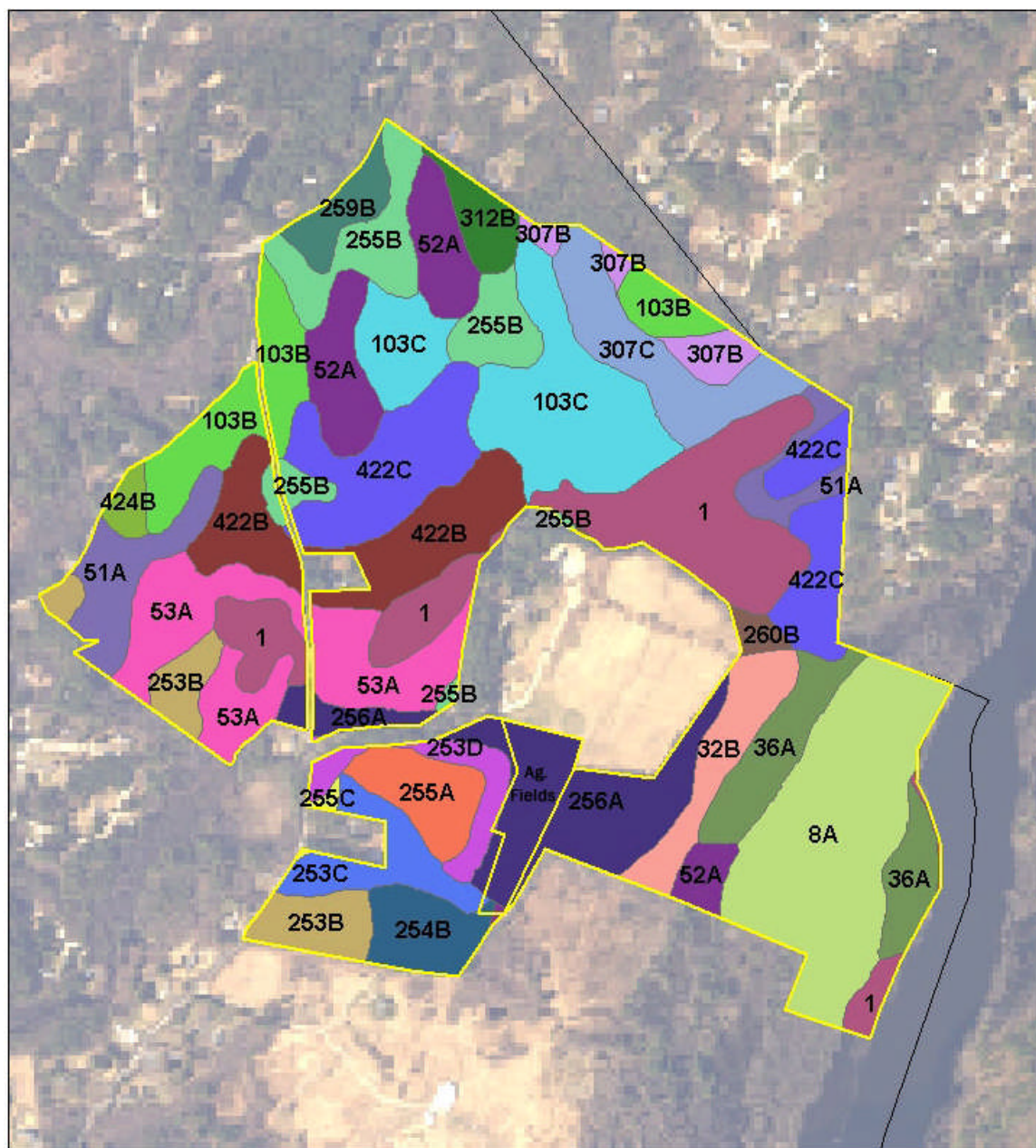
3. Farmland rated as either Prime or Locally Important ("Important"). See text for definitions.

Source: Middlesex Conservation District, Soil Survey Report (1995), and

Massachusetts Association of Conservation Districts GIS system (Westford, MA)

Subclass Definitions

- e Soil is mainly limited by risk of erosion unless close-growing plant cover is maintained.
- s Soil is limited mainly because it is shallow, droughty, or stony.
- w Water in or on the soil interferes with plant growth or cultivation.



See Table 1-2 for soil names and characteristics.



Figure 1-13. Greenough Land Soil Types

2. Purchase of the Greenough Land

2.1 Overview

Carlisle purchased the Greenough Land from Henry Vose Greenough on August 23, 1973¹, for the sum of \$385,200. The purchase was followed by a friendly taking (by eminent domain) which was voted by the Selectmen on September 19, 1973. The taking was recorded on September 20, 1973, in the Middlesex North District Registry of Deeds², Book 2086, Page 60. This purchase, and taking by eminent domain, had been authorized at a Special Town Meeting on November 28, 1972. The sale was handled by conservators of Mr. Greenough's estate (at the law firm of Goodwin, Procter & Hoar in Boston) as Mr. Greenough, then in his ninetieth year, was deemed to be no longer competent. (Mr. Greenough died in December 1976 at age 93.) On August 27, 1973, the confirmatory deed for the purchase and taking was registered in Book 2086, Page 64.

The Town's vote to authorize the purchase (November, 1972) had been made contingent on approval of State and Federal financial assistance totaling 75%. Through a tremendous effort by the Conservation Commission at the time, such approval was received. The amounts received (payments were in 1974) were as follows:

Federal:	Land and Water Conservation Fund	\$192,600 (50%)
State:	Self Help Fund	<u>\$ 96,300 (25%)</u>
	Total:	\$288,900 (75%)

The 75% reimbursement meant the Town only had to pay \$96,300, \$40,000 of which came from monies already in the Town's Conservation Fund. The final cost to the Town thus came at a rate of \$378 per acre.

On February 5, 1972, the sum of \$5,000 was paid to the Greenough conservators for an option to buy the Greenough Land. On September 19, 1973, payment of \$380,200 was made to the conservators.

The State's reimbursement check for \$96,300 was dated March 7, 1974. Notice of the planned reimbursement had been received in a letter dated January 3, 1974. The Federal Land and Water Conservation Fund reimbursement check for \$192,600 was dated February 7, 1974. Notice of the approval for reimbursement had been received in a letter dated July 17, 1973.

The purchase of the Greenough Land was difficult due to a number of factors, including the following:

- Buying a very large parcel at a very significant price;

1. This is the date on which the conservators of Mr. Greenough's estate signed the confirmatory deed granting the land to the Town of Carlisle.

2. All deeds mentioned in this section are recorded in the Middlesex North District Registry of Deeds.

- Dealing with conservators who had strict fiduciary responsibilities, and who were hoping to sell as much of Mr. Greenough's 280-acre estate as possible to a single buyer;
- Negotiating details of a life estate Mr. Greenough wanted to grant to Mr. and Mrs. Windhol, caretakers of the land;
- Applying for, and receiving approval for, 75% reimbursement from Federal (50%) and State (25%) programs; and
- Getting Town support for the purchase.

An interesting, personal account of the Greenough Land purchase was written by A.E. Benfield, Chairman of the Conservation Commission at the time of purchase, and published in the *Carlisle Mosquito* on March 14, 1986. Some of the information from that article, as well as other details of the purchase, are provided in the subsections below.

2.2 Other Simultaneous Sales from the Greenough Estate

Mr. Greenough's estate in 1972 totaled about 280 acres, 8 of which were in Billerica. At the time that Carlisle purchased the bulk of the property (242 acres), there were four other sales of the remaining portions:

1. The Greenough house (528 Maple St.) and approximately 30.1 acres were sold for \$120,000 to Peter T. and Joyce L Webster on August 10, 1972. This land is in the middle of the Town's Greenough Land, and is reached by a narrow (private) road from Maple St. Their deed is recorded in Book 2024, Page 385.
2. A 2-acre lot on Maple Street was sold to Frances O'Rourke for \$39,000 on August 23, 1972. The deed is recorded in Book 2029, Page 96.
3. A 2-acre lot on Maple St. was sold to Armando and Blanca J. Vasquez for \$22,500 on August 30, 1972. The deed is recorded in Book 2030, Page 55.
4. The 8-acre lot in Billerica was sold to the Carlisle Conservation Foundation for \$11,000 on August 23, 1973. The deed is recorded in Book 2086, Page 70.

2.3 Additional Purchase Details

Appraisals

Town records indicate that five appraisals were received for the land to be purchased. They ranged from \$296,000 to \$396,200. Some of the appraisals give good descriptions (one with photos) of the land and buildings as of 1972. It is not clear how the appraisals were used to arrive at the agreed purchase price of \$385,200.

The appraisals noted that substantial portions of the property were below elevation 120 feet, the flood hazard line, and that much of the land was wetland. This clearly affected the appraisal.

Public Relations

To help encourage the public to support the proposed purchase, the Conservation Commission organized a guided tour of the property in August 1972, and prepared a 4-page brochure entitled: *Proposed Greenough Conservation – Recreation Area*. The brochure contained a description of the special features of the property, a regional map, and photographs. A Public Hearing was held on November 20, 1972.

Special Town Meeting – 1972

Under Article 4 of the Town’s Special Town Meeting on November 28, 1972, by a vote of 243 YES and 21 NO, it was:

“...voted that the Selectmen be authorized in the name and on behalf of the Town to take in fee by eminent domain under Chapter 79 of the General Laws for conservation purposes, as provided by Chapter 40, Section 8C of the General Laws, and for outdoor recreation...[the Greenough Land].”

The motion specified the land to be purchased (described in five parcels: A, B, C, D and E), the purchase price (\$385,200), and further stated that:

“PROVIDED, that in no case shall the Selectmen acquire said parcel until application has been made to and approved by the Bureau of Outdoor Recreation under the Land and Water Conservation Fund Program of the United States Department of the Interior and the Massachusetts Department of Natural Resources under Chapter 132A, Section 11 of the Massachusetts General Laws for financial assistance amounting to 75% of the approved Acquisition cost.”

Article 5 at the Special Town Meeting (voted unanimously) authorized the Conservation Commission to apply for the State and Federal reimbursements described above.

Life Estate

The purchase of the Greenough Land was subject to a Life Estate covering a small portion of the estate, including the farmer’s cottage, barn and surrounding land (~ 2 acres). The Life Tenancy was technically available to Mr. Greenough, his heirs or assigns. The actual Life Tenants were Alfred and Elizabeth Windhol, husband and wife, who were caretakers for the Greenough estate. The Life Estate allowed the Windhols to use the above-mentioned buildings and land, and to access the property over the private driveway (then owned by Mr. and Mrs. Webster) from Maple Street. The Life Estate was to end two years after the death of Henry Greenough. (Mr. Greenough died on December 19, 1976.) During the period of the Life Estate, the public was given the right to cross the Life Estate to access other portions of the Town-owned land.

As required by Federal law (PL 91-646), the Windhols were offered relocation reimbursement should they have wished to move off the Life Estate.

In fact, the Windhol's use of the Life Estate area continued well past the legal deadline of December 19, 1978. On August 17, 1990, Town counsel informed Mr. and Mrs. Windhol that they would be allowed to stay in the farmer's cottage as long as either one of them was alive and they desired to stay there. However, they were told that their sons would not be allowed to stay there afterwards. Elizabeth Windhol died on May 27, 1995, at age 77. Alfred Windhol died on March 2, 1997, at age 83.

Land Swap with the Workums

Starting in 1991 and ending in 1993, actions were taken to correct an error in the initial taking of the Greenough Land which had resulted in a portion of the private driveway (to the Workum's house [528 Maple St.]) being on Town-owned land. The error was found when engineers were preparing the Workum's lot for subdivision. To correct this error, the Town and the Workums agreed upon a land swap of 1,346 square feet that put the Workum's drive on their own land. The land received from the Workums was along their drive. (See following subsection for reference to a map showing the location of the parcels that were exchanged.) The swap was approved at the Annual Town Meeting on April 27, 1993.

Plans of Land

Following purchase by the Town, no survey was undertaken of the Greenough Land. However, other plans are available which should assist in finding and marking the boundaries of the Town-owned land. These include:

- Plan of Land in Carlisle and Billerica Owned by Emery H. Greenough.³ Prepared by Horace F. Tuttle, Surveyor, July 1931. (Scale 1 inch = 200 ft). A copy of the plan is in the Middlesex North District Registry of Deeds (microfilm) in Plan Book 56, Plan 58.
- Plan of Land in Carlisle being a Portion of the Greenough Estate. Prepared by R.D. Nelson, Civil Engineers, Concord, MA, January 10, 1971. (Scale 1 inch = 100 feet) This was for the private land (Parcel A, ~ 30.1 acres) to be sold to the Websters.
- Plan of Land in Carlisle being a Portion of the Greenough Estate. Prepared by R.D. Nelson, Civil Engineers, Concord, MA, June 1, 1972. (Scale: 1 inch = 100 feet) This was for the two private lots – on the east side of Maple St. – sold out of the Greenough estate.
- Plan of Land in Carlisle Prepared for Fifield Workum Jr. by The BSC Group-Bedford, Inc., Bedford, MA, August 12, 1991 (revised April 8, 1992). (Scale: 1 inch = 100 feet) This plan shows the subdivision (into two lots) of the Workum land, and also shows the portions of land involved in the above-described land swap with the Town. The plan also gives reference to registered plans 7 and 33 in Plan Book 115, which are likely the 2nd and 3rd plans mentioned above.

3. Emery H. Greenough was the wife of Henry V. Greenough. She had acquired essentially all of the land in the Greenough estate through a series several purchases between 1928 and 1941.

- Plan of Land in Billerica prepared for the Carlisle Conservation Foundation, Inc. (CCF), by Stamski and McNary, Inc., October 1, 2007. (Scale: 1 inch = 50 feet)
This plan, based on a survey, is for the entire conservation property in Billerica purchased by CCF from the Greenough estate. This land abuts the Greenough conservation land in Carlisle.

Documentation

Copies of all of the documents mentioned in this Section 2 are in the Conservation Commission files in Town Office.

Easements

There are a total of three easements that grant limited access to the Greenough Land over land owned by others. See Section 1.3 for details.

3. Historic and Current Uses

3.1 Cultural History of the Greenough Land

Native American Presence

Based upon a 2003 study by Dr. Curtiss Hoffmann and Adrienne Edwards¹, the Greenough Land area has a higher-than-average potential of having Native American archaeological sites. Their study looked at various diagnostic variables such as soil types, elevation above water, distance to major rivers (such as the Concord R.), and proximity to ponds and lakes. In general, most of the eastern portion of Carlisle (within 2,000 feet of the Concord R.) has favorable soils, elevation and/or slopes, with the exception of the wetlands to the north of Route 225 adjacent to the River and a couple of other smaller areas. The area within 200 meters of the current Greenough Pond was considered especially likely to contain archaeological sites.

Although the subject is still controversial in some circles, there is a growing consensus in the archaeological community that many of the stone features found in certain areas are of Indian origin. This point of view has been greatly reinforced by the position of representatives of various tribes and a national organization, United South and Eastern Tribes (USET). Typically these features take the form of stone piles or rows of stone. Occasionally representations of living beings such as turtles are found. The stone piles and rows have similarities to objects created by European farmers and sometimes it is difficult to decide who built them. Of course Indians were farmers too.

Stone features have been identified on a large portion of the Greenough Property.² However, they seem to be concentrated on the land north of the brook and pond complex. There are examples on the properties on both sides of Maple Street. They are found as far north as the property boundary and probably extend farther. This area is extremely rocky and has many enormous and dramatic boulders and other formations.

South of the brook and pond, the character of the land changes dramatically. There are essentially no surface stones in the area between the open fields and Maple Street. The only exceptions are some rocks adjacent to the fields that have been placed, perhaps from the fields. Much of this area is a hill which appears to consist of sand. Sand areas, especially near water, were apparently favored by the Indians for burials. Often these are not marked and it may be that this area was used in that way.

Cultural History from 1757 to 1973 (Purchase by Town)

According to Ruth Wilkins (*Carlisle and Its History and Heritage*, Carlisle Historical

1. "The SUASCO Watershed Archaeological Inventory Project: Exploring the Cultural Resources of a Suburban Area." Report by Dr. Curtiss Hoffmann and Adrienne Edwards, Department of Sociology, Anthropology, and Criminal Justice, Bridgewater State College, Bridgewater, Massachusetts, 2003.

2. Information on the identified stone features is available from Tim Fohl, Land Stewardship Committee.

Society, 1976)³, the first European settlers on the Greenough land were Solomon and Elizabeth Andrews, and two of their ten sons, Edmund and Issachar, who came by ox sled from Ipswich in 1757. They cleared the land around the home currently at 528 Maple St. The existing house at this address may still contain portions of the original Andrews home. Solomon Andrews operated a grist mill near his home on Pages Brook that runs to the north of the house. The general location of the mill is shown on the Historical Map of Carlisle in Wilkins' book. The flat fertile meadows on the property were once a training ground for the Revolutionary soldiers. About 1830, the property was purchased by Capt. Thomas Page, for whom Pages Brook is named, who also operated a grist mill there until his death in 1860. The mill was taken down in 1885, and, in 1917, the mill stones were taken to a private home in Concord. Beer's Atlas (1875) also shows a hoop factory at this site.

From 1884 to 1923, the former Andrews property was occupied by the French family. When they arrived, the meadows stretched from the house to the Concord River. Mrs. Joanna (Proctor) French was a direct descendant of Solomon Andrews. One of their sons, Edmund L. French, lived there from 1884 (age 1 year) to 1917 (marriage to Mary MacDonald), and then resided in Carlisle, first on Bedford Rd. then River Rd., for many years thereafter. Edmund French was a carpenter, printer and noted photographer of Carlisle life in the 1900s. Portions of his interview with Ellen Huber (part of Carlisle's Oral History Project) that relate to the Greenough land are cited below. Edmund French died in 1981.

In Edmund French's Oral History interview with Ellen Huber (on May 27, 1976), he mentioned a few interesting facts regarding the Greenough Land when he (French) lived and worked there. His father was a market gardener and also had 15 – 18 cattle and three horses. Two of the horses, Tom and Jerry, were the heavy farm horses and the third, Hallie, was the driving horse. The horses lived in a barn (which no longer exists) that had a windmill on it that was destroyed in an "August gale" (a hurricane).⁴ It appears that Mr. French also worked for Mr. Greenough after the Greenoughs acquired the property (ca 1928), apparently with Mrs. Greenough's money. He tells a story of Mrs. Greenough asking for the layout of the already-constructed Greenough barn to be changed because: "When I open the doors, I want to see the head of the cows, not their rear end." Regarding the farming activity during the Greenough's tenure, Mr. French said that "Greenough didn't farm it. He had [Alfred Windhol], a Swedish man, and he worked hard. He was a good farmer." Mr. French apparently helped build the Greenough barn, although he said that specialists were brought in to install the slate roof. The Greenough's house was impressive enough to be the subject of an article in the May 1930 edition of *House Beautiful*. Mr. Greenough, according to his obituary in the *Concord Journal*, was a

3. Additional historical information taken from: (1) a July 1982 brochure on The Greenough Land prepared by Susan Emmons for the Carlisle Conservation Commission; and (2) *Old Houses and Families of Carlisle Mass.*, Vol. 9 by Marta, Fifield Wilkins.

4. The windmill's exact location (Lat. 42° 31' 50.34", Long. 71° 18' 47.42") was apparently an important reference survey point as far back as 1893. This location is just on the east side of the present house at 528 Maple St. (i.e., the former Greenough house).

textile manufacturing executive in Boston for nearly 50 years; he died in a nursing home in Waltham on December 19, 1976.

As indicated above, the Greenoughs did operate a farm on their property for most of their tenure (approximately 1928 – 1973). No farming operations were apparently ongoing when the Town purchased the land in 1973. The farming was done by Alfred Windhol. The Greenough's farming operations included the raising of cows, pigs, turkeys and chickens. Corn and other crops were grown in the fields. A layout (undated) of their farm buildings, including the farmer's cottage used by Alfred and Elizabeth Windhol and their family, is shown in **Figure 3-1**. The land use patterns around the Greenough estate ca. 1937 are shown in **Figure 3-2**. This Figure shows the substantial farm lands ("open fields") heading south southwest from the Greenough Pond. By the time of a May 1971 aerial photo⁵, the "open fields" (on the east side of Maple St.) in the lower left of this Figure are seen to be a pine plantation. (The plantation includes the area around the dotted-line road ending in a loop.) This pine plantation is visible in current aerial photographs. (See Figure 1-5 in Section 1.)

The dam for the Greenough Pond was built by the Greenoughs at some time prior to July 1931. It is thought that the pond was created primarily to provide habitat for waterfowl. Mr. Greenough, a member of the Nuttall Ornithological Society, was a bird enthusiast.

At some time in the past (dates unknown), a telegraph line crossed the property along an east-west line. The single wire was mounted on poles, the remnants of which may still be seen in a few locations.

3.2 Current Uses of the Greenough Land

Overview

The Greenough Land is used primarily for conservation, passive recreation, and agriculture.

The conservation values derive from a variety of factors including:

- The large parcel size (242 acres);
- Linkages with other conservation lands yielding a conservation area of over 740 acres;
- The diversity of wildlife habitat available: upland deciduous and coniferous forests, wetlands, surface waters (stream and large pond), vernal pools, and open fields;
- Wood duck nesting boxes on the property, the nearby Concord River, and the Great Meadows National Wildlife Refuge (GMNWR) make the property especially valuable for water fowl; and
- The lack of any active recreation or other events which can disturb wildlife.

5. This aerial photo is in Town Office.

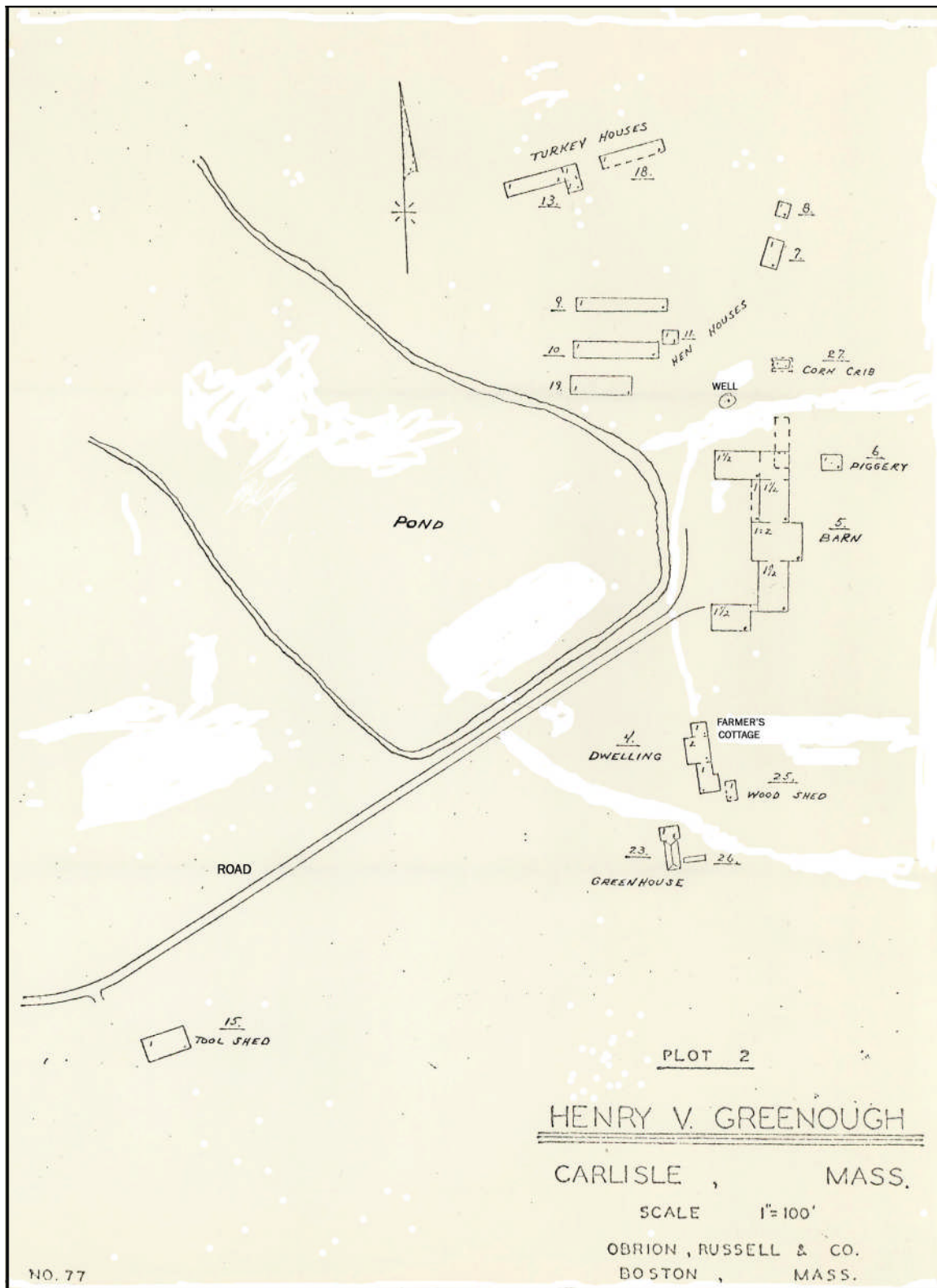
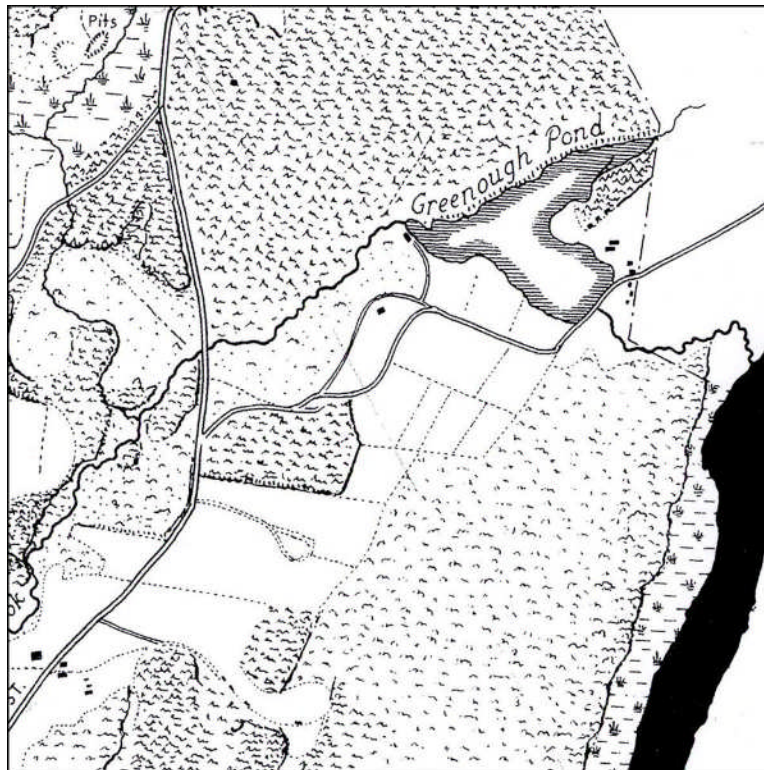








Figure 3-1. Location of Henry Greenough's Farm Buildings



-  pine forest
-  forest
-  brush
-  swamp
-  orchard
-  open fields

Note: Vegetation types are taken from photographs only and they are subject to revision by ground control.

Source: Portion of a *Map of Carlisle*, prepared by Erwin Raisz and Walter Webster from aerial photographs by Bradford Washburn. Mosaic by Edward S. Wood, Jr. Institute of Geographical Exploration, Harvard University, 1937. Distributed by the Carlisle Historical Society.

Figure 3-2. Land Use in the Vicinity of the Greenough Land ca. 1937

The recreational uses are primarily associated with the significant trail system on the property, the trail connections to the GMNWR and, past that, to the Foss Farm conservation area. The trail use is mainly for hiking, running, cross-country skiing and snow-shoeing; a few horseback riders also use the wider trails. The 21-acre Greenough Pond is a potential recreational area for canoeing, fishing, ice fishing, and skating. These activities are explicitly allowed by the Conservation Commission's Rules and Regulations. However, lack of direct access from a road has probably been a significant factor in restricting such pond uses.

The significant natural and historical features on the property make it valuable for a variety of public education activities. However, it appears that only the Carlisle Trails Committee has conducted educational walks on this property. On April 29, 2007, the Trails Committee and the Conservation Commission jointly sponsored a vernal pool walk on the Greenough land led by naturalist, and former Conservation Commissioner, Christine Kavalauskas. Some limited research studies by MassWildlife on wood duck populations have involved the Greenough Land. In addition, Biodiversity Day studies have been carried out on the property in at least two years (2005 and 2007) led by Tom and D'Ann Brownrigg. Periodic studies of a rare plant population also take place on the property. (See Section 4 for more information on the wood duck, Biodiversity Day and rare plant studies.)

The 1985 Citizen Survey conducted for Carlisle's 1986 Open Space and Recreation Plan showed that the Greenough Land was the least used of all Carlisle's major conservation and recreation lands.⁶ This situation would appear to hold at present as well in spite of the very adequate parking available. The Greenough Land appears to be a gem hidden from most of the public's view.

Agriculture

The approximately 4 acres of open fields on the Greenough Land have been leased to local farmers for at least the past 15 years. (Earlier records could not be found.) **Table 3-1** lists the most recent lessees, their crops and yields, and available information on soil amendments and pesticides used, if any. In the period 2006 to 2008, the licensee (Mark Duffy) was also able to lease the adjacent fields that are on private land and covered by a Conservation Restriction held by the Town (CR #30).

Buildings

Of the original farm buildings on the Greenough estate, only the slate-roof barn and the farmer's cottage remained in use after the Town acquired the land. The remaining buildings had either fallen down or were not useable.

6. Of all respondents to the question on frequency of parcel use, the average number of times visited per year was as follows (most frequent first): Great Brook Farm State Park (8.3), Spalding field (7.0), Town Common (6.9), Banta-Davis soccer field (4.5), private trails (4.3), Estabrook Woods (3.2), Cranberry Bog (2.8)(private land at the time), Foss Farm (2.8), Greenough Land (2.2), Town Forest (2.0); all others < 2.

Table 3-1. Summary Data on Agricultural Use of the Greenough Fields¹

Year	Farmer	Crop	Reported Yield/Acre	Reported Use of:	
				Fertilizers ²	Pesticides or Herbicides
2008	Mark Duffy ²	Corn	No data	Yes	Roundup
2007	↑	Corn	No data	Yes	Roundup
2006		Corn	No data	Yes	Roundup
2005		Hay	No data	Yes	No
2004	Gerald Cupp ⁴	Hay	1/2 ton	No	No
2003	↑	Hay	1200 lbs	No	No
2002		Hay	2 1/2 tons	No	No
2001		Hay	1 ton	No	No
2000		No information in files.....			
1999		No information in files.....			
1998		No information in files.....			
1997	Thomas O'Rourke ⁵	Hay	58 bales	Yes	No
1996	↑	Hay	No data	Yes	No
1995		No information in files			
1994		Hay	120 bales	Yes	No data
1993 ⁷		Hay	2 tons	Yes	No data
1992				Proposed ⁶	Proposed ⁶

1. The two fields involved are reported to total about 4 acres. The annual farmer's reports commonly indicated that 3 to 4.4 acres were farmed.
2. Includes soil amendments.
3. Great Brook State Park Farm, Carlisle.
4. Larkspur Farms, Concord.
5. Maple St., Carlisle.
6. Land use plan submitted for 1992 listed plans to grow pumpkins and a timothy-clover mix. Plans indicated possible use of fertilizers and Sevin (a pesticide).
7. In the fall of 1993, the two fields were mowed, harrowed and reseeded.

The farmer's cottage was used as a residence by Alfred and Elizabeth Windhol until 1997. Mr. Windhol had been the farmer and farm caretaker for Henry Greenough. (See Section 2 for more information on the Windhol's tenancy.) After their departure, the cottage remained unused, and its condition slowly deteriorated. For a few years following the Windhol's departure, starting around 1998, the Conservation Commission tried to find a tenant for the cottage (and barn) but was unable to do so. In September 2004, the Conservation Commission voted to turn over the responsibility for management of the cottage and barn to the Board of Selectmen. At the April 30, 2007 Annual Town Meeting, the Selectmen were authorized to use up to \$25,000 of Community Preservation Act funds to demolish the cottage and restore the land to open space. This act was precipitated by concerns over liability related to the deteriorating condition of the building, and the presence of asbestos in the building. The cottage and adjacent greenhouse were demolished in late 2007.

For a number of years, the barn was used by Paul Booth (River St., Carlisle) as a working and storage area. His use of the barn was terminated in early 2007. For a few years prior to Mr. Booth's use, starting around 1998, the Conservation Commission had sought to lease the building to someone who would take care of it and make needed repairs. In 1993, the Conservation Commission asked for bids for the demolition of the barn. Further details relating to barn maintenance are provided in Section 5.

Commercial Filming

In 2003, permission was given to Blue Cross and Blue Shield to film a commercial on the Greenough Land. Compensation was made in the form of a \$500 donation to the Conservation Gift Fund.

Problem Uses

There have been only occasional reports of problem uses of the Greenough Land. These have included:

- Use of dirt bikes and (motorized) 4-wheelers (December 2003); police investigated;
- An illegal campsite in the woods (near north shore of Greenough Pond) (> 10 years ago);
- Illegal fire pits, with chairs and benches (on north shore of Greenough Pond and on the south side of the pond) (2007-2008);
- Electric utility lines on poles leading to the private residence at 528 Maple St. (present at time of land purchase) and associated clearing of trees underneath the utility lines (2006-2007);
- The making and use of unofficial trails, often dead ended and near the north parking lot, by groups that leave trash behind. The north parking lot is apparently a known rendezvous location for gay men, and this may be part of the trail/trash problem. Trash is often found at the south parking lot and nearby skating shelter;
- Vandalism (e.g., breaking of windows) on the buildings on the property;
- Discharge of firearms, probably by hunters (several years); police investigated;

- Defacing of trail signs and trees with paint (2007-2008).

3.3 Land Use Restrictions Associated with Sources of Purchase Funds

As indicated in Section 2, purchase of the Greenough Land included funding from the following sources:

- Federal Land and Water Conservation Fund - \$192,600 (50%)
- Massachusetts Department of Natural Resources – Self Help Program - \$96,300 (25%)
- Town of Carlisle, Conservation Fund - \$40,000 (10.4%)

Land purchases made with funds from each of these sources are subject to certain restrictions:

Federal Land and Water Conservation Fund. This Fund was established by the Federal Land and Water Conservation Fund Act of 1965, 78 Stat. 897. The environmental Handbook for Massachusetts Conservation Commissioners states that any project receiving money from the fund:

“...becomes permanently protected parkland. The boundary plan is the permanent protected boundary for the site. Any boundary encroachment, change of use or lack of basic maintenance constitutes a conversion. If a conversion is anticipated, DCS [Department of Conservation Services] must be notified. Any proposed conversion must be approved by DCS and the National Park Service and the project applicant must offer another site of equal monetary value and recreational use.”

In addition, land purchase with Federal Land and Water Conservation Funds must be available for use by anyone—not only Carlisle residents. Residents of adjacent or distant towns may use the property.

Massachusetts Self- Help Program. The Massachusetts Self-Help Program was established in 1960 by M.G.L. Chapter 132A, Section 11 to assist Conservation Commissions established in municipalities in the acquisition of land for conservation and passive outdoor recreation purposes. Properties purchased with Self-Help funds may only be used for conservation and passive outdoor recreation. Passive recreation is defined as any activity that can be casually performed outdoors with minimal disturbance of an area’s natural condition.⁷ Examples of passive recreation include hiking, picnicking, cross-country skiing, and informal sports activities on an open field. Examples of active recreation provided in official documents include competitive sports or sports in man-made facilities such as baseball, basketball or golf. Further, the policy states:

7. Statement of Policy Regarding M.G.L. Chapter 132A, Section 11, The Self Help Program, Massachusetts, DCS.

“Therefore, development of facilities on Self-Help land is limited to such items as trails, comfort stations, small parking areas, small shelters or maintenance support structures, boardwalks over wet areas, duck blinds, etc.”

Carlisle Conservation Fund. The funds under the jurisdiction of the Carlisle Conservation Commission are governed by the Conservation Commission Act G.L. Chapter 40, Section 8C; Acts of 1996, Chapter 258, Section 15. Conservation Commissions, Establishment; Powers and Duties. The provisions of the law state that money in the funds established by Conservation Commissions may be used to:

‘...acquire, maintain, improve, protect, limit the future use of or otherwise conserve and properly utilize open spaces in land and water areas within its city or town, and it shall manage and control the same.’

3.4 Land Use Restrictions Associated with State-Funded Agricultural Land Purchases

There is an Executive Order that was passed by Governor Edward J. King, on March 19, 1981, that addresses agricultural uses of lands purchased with State funds. This Executive Order #193 would apply to the Greenough Land. In its preamble, Executive Order #193 discusses the significance of agricultural land in Massachusetts as a finite natural resource that is being threatened by competing land use interests. The benefits of agricultural land listed by Governor King include:

- Reducing flooding by absorbing rain and snow waters
- Replenishing critical groundwater supplies by preserving a pervious surface
- Purifying the air by keeping land open and supporting natural vegetation
- Enhancing wildlife habitat
- Maintaining the aesthetic and historic quality of the landscape

The Order acknowledges the continual loss of privately owned agricultural land and makes the case that state-owned land in agricultural use is increasingly playing a larger role in preserving this valuable natural resource for future generations. It states:

“State funds and federal grants administered by the state shall not be used to encourage the conversion of agricultural land to other uses when feasible alternatives are available.”

And,

“State agency actions shall encourage the protection of state-owned agricultural land by mitigating against the conversion of state-owned land to nonagricultural uses, and by promoting soil and water conservation practice.”

For purposes of the Executive Order, state-owned land is defined as all lands purchased in whole or in part with state funds or federal funds administered by the state. The Order defines agricultural land as land classified as Prime, Unique, or of State and Local Importance by the USDA Soil Conservation Service, as well as land characterized by active agricultural use.

The Greenough Land (at least the agricultural fields and the pine plantation) meets the applicable definitions set forth in Executive Order 193. It was purchased with state funds, the land is and has been in agricultural use for many years, and the soils on much of the property have been designated as Prime or Locally Important by the Soil Conservation Service. Therefore, the Greenough Land is subject to the requirements set forth in Executive Order 193.

4. Previous Planning or Other Study Documents

4.1 Overview

The following studies are described in this section:

Whole Property Studies and Plans

1972 - Wacker: Natural Resource Analysis & Land Use Plan

1990 – Lenthall: Greenough Land Trip Report

1992 – Greenough Management Plan

Studies Focusing on Specific Areas or Features

1992/3 – Consideration of forestry plan with Lands Sake

1989-2004 – Studies of the Greenough Dam

1998-2004 – Asbestos and Lead Testing in the Farmer’s Cottage

2004 – Cottage and Barn Property Inspection

2006 – Vernal Pool Investigations and Certification

State-Listed Rare Species (NHESP)

Bird Lists for Greenough and GMNWR (Tom Brownrigg)¹

Wood Duck Nesting Boxes and Monitoring (Mass. DFW)¹

Britton’s Violet: Population Monitoring (Sally Zielinski)¹

Biodiversity Days (Visible Species) Data (Mass. EOEEA)¹

Marsh bird study (Brian Tavernia, Tufts University)

Plans for Abutting Conservation Lands

Carlisle Conservation Foundation – Billerica Reservation

Great Meadows National Wildlife Refuge

4.2 Whole Property Plans

Natural Resource Analysis & Land Use Plan (John Wacker & Associates, Weston, MA). 1972

In August, 1972, the Conservation Commission hired (for \$1,200) John Lee Wacker (John Wacker & Associates, Weston, MA) to prepare: (1) a natural resource analysis of the land; and (2) a land use plan for future development. Work was to be completed by October 15, 1972. The study was apparently a requirement of the State’s agreement to provide Self-Help funding for the Greenough purchase which was to come a year later.

Although a folder exists in Town Office files with information on the initiation of this study, no copy of the final report has been located. The file does contain a copy of one map, apparently from the final report, which shows key elements of the proposed land use plan. The map shows proposed parking lots, access points, existing and proposed trails, points of interest, and potential land uses.

1. These studies are continuing, although not on a regular basis.

The plan proposed by Wacker was clearly followed in many particulars. In an April 23, 1975 letter to the Carlisle Conservation Commission, Wacker complements the Commission on work accomplished on the Greenough Property Land Use Plan. The letter provided several observations on, and suggestions for, plan implementation.

Greenough Land Trip Report (Dan Lenthall, District Conservationist), 1990

A July 25, 1990, letter to the Conservation Commission by Dan Lenthall, Middlesex District Conservationist (Acton, MA), documents an inspection of the Greenough property based on his walking nearly every trail on the property. Included are two maps which give the location of trails and other items discussed in the letter. Specific comments or recommendations are provided for: (1) improvement of existing trails; (2) addition of new trails; (3) bridge repair; (4) points of interest (cultural history and ecological); (5) drainage problem from new house construction on abutting private land; (6) improvement of wildlife habitat; and (7) use and improvement of the agricultural fields. Attached to the letter are several Soil Conservation Service pamphlets on conservation land management.

The Lenthall trip report provided the basis for the 1992 Management Plan discussed below.

Greenough Conservation Land - Management Plan, 1992

In 1990, the Middlesex Conservation District awarded a grant to the Carlisle Conservation Commission to develop a land use plan for the Greenough Land. The resulting report – *Greenough Conservation Land: Management Plan, 1992* – is 22 pages long including 9 pages of appendices. The “...Plan identifies the Greenough Land’s natural and historic features, details past and present uses, and outlines seven categories of management...” in the following areas:

1. Public education
2. Public access, use and parking
3. Trails
4. Wildlife habitat management
5. Recreation
6. Stewardship and maintenance of the conservation land
7. Rules and regulations

As noted in the subsection above, the July 25, 1990 trip report by Dan Lenthall, District Conservationist, provided a basis for this Plan. Several bound copies of the Plan are in the Conservation Commission files.

Table 4-1 presents a summary of the Action Items recommended by the 1992 Plan. (See the Plan for more details on any recommendation.) Note that many of the recommendations have been implemented (particularly in the area of trail maintenance), and many have not.

Table 4-1. Action Items Recommended by 1992 Greenough Management Plan

PUBLIC EDUCATION	
Research	<ul style="list-style-type: none"> ▪ Historical use research of property ▪ Wildlife inventory of the property ▪ Botanical inventory of the property
Interpretive Signage	<ul style="list-style-type: none"> ▪ At historic and natural features ▪ At botanical natural features ▪ At the main parking lot
Interpretive Walks	<ul style="list-style-type: none"> ▪ Use data collected from research
Rewrite and Reprint Greenough Pamphlets	
PUBLIC ACCESS, VISITATION AND PARKING	
Newspaper publicity to highlight features and events	
Regular trail maintenance and improved trail signs	
Trash barrels at parking areas, or promotion of carry-in, carry-out policy	
Install "private property" signs at points where trails enter abutting land to discourage trespassing	
TRAILS	
Trail Maintenance	<ul style="list-style-type: none"> ▪ Prune overhanging branches ▪ Install a consistent trail marking system ▪ Keep trails open ▪ Reopen and connect the trail to Foss Farm
New Trails	<ul style="list-style-type: none"> ▪ Create a trail to Town Forest ▪ Create trail around Greenough Pond. (This would require easement on private land.)
Bridge Repairs	<ul style="list-style-type: none"> ▪ Repair small bridges ▪ Replace larger bridge over wetland at east end of pond [Done in 1996]
Protect adjacent parcels of land	
Stop erosion from Billerica property onto Greenough land (one site identified)	
WILDLIFE HABITAT MANAGEMENT	
Conduct a study of existing wildlife habitats (plants & animals)	
Clean and repair Wood Duck nesting boxes [Being done by Mass. DCR]	
Manage hayfield area to provide habitat and nesting areas for wildlife	
Make clearings in hardwood areas	
RECREATION	
Regularly maintain trails	
Increase public education via map displays, walks and programs	
Improve public access for water-related activities	
Consider using the Greenough barn as a base for educational and recreational activities and programs	
Encourage small, hand-carried boat usages in the Greenough Pond	
Investigate desirability of stocking the pond with fish	
STEWARDSHIP AND MAINTENANCE	
Coordinate volunteer efforts for special projects. E.g., work with the Trails Committee to develop a plan for repair and maintenance of bridges, trails, better signage, etc.	
Continue mowing and maintaining fields under wildlife management guidelines	
Develop a forest management plan for wildlife enhancement and revenue to the Town	
Continue to assess the need for repair of Life Estate buildings and their future uses	

4.3 Studies Focusing on Specific Areas or Features

Consideration of Forestry Plan with Lands Sake (1992)

In 1992/3, the Conservation Commission held discussions with the not-for-profit Lands Sake (Weston, MA) about a possible forestry plan for the Greenough Land. No further details are available in Town Office files. It is noted that Lands Sake has a long history of successful forest management on public and private lands in Weston.

Studies of the Greenough Dam (1989 - 2004)

1989: Soil Conservation Service Assessment

In a letter to the Conservation Administrator dated May 23, 1989, the USDA Soil Conservation Service District Conservationist, Mark D. DeBrock, provided assessments and recommendations on the Towle Land and Greenough Pond dams. The Greenough Pond dam and associated structures, he said, "...appear to be in good shape. Repairs have been made where the dam was breached two years ago. In the future, this area and other low spots should be raised so that there is a level grade across the top of the dam." He also addresses the problem of tree growth on the dam. On this issue he concludes that: "Short of total reconstruction, there is no way to address this problem...."

2000: State Inspection of Dam

In a letter dated October 17, 2000, R. David Clark, Chief of Dam Safety for the State's Department of Environmental Management (DEM), told the Conservation Commission that the Greenough Pond dam "...appears to be in fair to poor condition and not satisfactorily maintained. ... Furthermore, your spillway discharge capacity under the State's standard test flood appears to be inadequate and/or your outlet capacity is less than the estimated flow rate." The assessment was based on a visual inspection of the dam in August, 2000. Attached to the letter is a Summary and Recommendations section which includes the following information:

- The structural height of the dam is about 10 feet, the hydraulic height about 7 feet, the crest width about 10 feet, the length about 300 feet, and the normal and maximum water storage capacities approximately 45 acre-feet and 80 acre-feet, respectively.
- The two concrete/rock masonry spillways (total about 20 feet long) provide a maximum discharge capacity of 250 cubic feet per second (cfs). The spillway abutment walls are in fair condition.
- The upstream slope of the dam is not protected. Trees and brush have become established on the up- and down-stream slopes. There was evidence of erosion and animal activity on the up-stream slope. Seepage was observed along the tow of the dam.

- According to DEM criteria, the dam is classified as an **Intermediate** size dam.
- As a result of [no] downstream development in the area, the hazard potential of this site is classified as **Low** (Class 3).

The State recommended the following:

1. Both upstream and downstream slopes should be cleared of vegetation and re-inspected to check for animal activity and then determine the extent of repairs needed.
2. Clear tree roots (larger than 6") and vegetation roots from the dam and then repair the slopes.
3. Clear the debris and vegetation from in front of the spillways.
4. Remove the stoplogs as required during periods of heavy inflows to the pond.
5. Low areas and ruts on the crest of the dam should be filled in as required due to erosion.
6. The entrance to the spillways needs to be cleared of debris. Also the stop-log elevations should be lowered as required to prevent the dam from overtopping during heavy inflows to the pond.
7. Check the hydrology and hydraulics associated with the upstream drainage area to determine the spillway capacity.
8. Prepare an operation and maintenance plan for the dam.
9. Retain the services of a registered professional civil engineer that is experienced in the construction and repair of dams to oversee items 2, 7 and 8.

2004: Stevens Associates: Report of Dam Engineering (dated September 1, 2004)

At the Annual Town Meeting in May, 2001, the Town voted to authorize \$13,050 for a professional engineering study of the Greenough Pond dam. The contract was awarded on August 21, 2001 to Stevens Associates (Wilmington, MA) after a period of proposal requests and evaluations that had been initiated in late 2000. The Stevens Associates report of September, 2004, contains the following sections:

- Background
- Site Location and Description
- Elevation Datum
- History of Greenough Dam
- Dam Classification
- Dam Safety Inspection [Inspection conducted October 16, 2001]

- Inflow to Greenough Pond
- Hydraulic and Hydrologic (H&H) Analyses
- Selection and Design of Repairs
- Limitations
- Appendices (including an inspection report, design drawings, calculations, and an operation and maintenance plan)

The H&H analyses indicated that the current peak pond discharge for the 50- and 100-year storm return periods was 195 cfs and 251 cfs, respectively. The projected discharges after the proposed dam repairs were 228 cfs and 267 cfs, respectively.

Appendix D of the Stephens Associates report is an Operation and Maintenance Plan for the dam. It included detailed designs for suggested dam repairs and subsequent dam maintenance and inspection. A summary of the Plan recommendations is given in **Table 4-2**. The Plan itself did not contain a cost estimate for the suggested dam repairs, but in a January 2003 meeting with the Conservation Commission an estimate of \$80,000 \pm 20% was provided by Robert Stephens of Stephens Associates.

Asbestos and Lead Testing in the Farmer's Cottage (1998-2004)

On at least two occasions, the farmer's cottage was tested for asbestos and/or lead paint. Reports include the following:

- Asbestos Survey of 520/528 Maple Street, Carlisle, MA. Prepared for the Conservation Commission by Envirotest Laboratory, Westwood, MA, 1998. Based on a June 22, 1998 inspection, Envirotest reported that asbestos-containing building materials were identified in the form of boiler insulation, pipe insulation and fitting insulation. Estimates were given for the costs of asbestos removal.
- Lead and Asbestos Inspections. Conducted for the Conservation Commission by Envirotest Laboratory, Inc., March 2004. Lead and asbestos were found in a number of locations.

Because the cottage has been demolished, further details are not provided.

Cottage and Barn Property Inspection (2004)

In January 2004, John R. Minty (Concord, MA) submitted a *Property Inspection Report* on the Greenough cottage and barn to the Conservation Commission. The 15-page report covers the following topics:

- House: General description, location, grounds, foundation and framing, structure type, exterior, plumbing, heating, electrical, insulation, floor finishes, chimney, windows and doors, kitchen, and smoke detectors.
- Barn: Garage doors, back barn wall, cupola, wood stove, old oil tank.

Table 4-2. Stephens Associates Operations and Maintenance Plan for Dam

Dam Repairs	<ul style="list-style-type: none">▪ Spillway 1 replaced with 3-box concrete culvert▪ Spillway 2 repaired▪ New concrete bridge slabs installed across culverts▪ Dam embankments cleared of vegetation and stumps and the slopes restored
Operating Procedures	<ul style="list-style-type: none">▪ Remove flashboards in anticipation of high water
Immediate Maintenance/Repair	Notify authorities and seek assistance if observe: <ul style="list-style-type: none">▪ Visible seepage exiting face of downstream embankment▪ Sinkholes▪ Sliding or sloughing of embankments
Required Maintenance at Earliest Date	<ul style="list-style-type: none">▪ Repair erosion of embankments and at spillway abutments▪ Maintain rip-rap on embankments and at spillways▪ Remove debris from within or in front of spillways
Continuing Maintenance	<ul style="list-style-type: none">▪ Monthly mowing to allow signs of stress, animal damage, etc. to be readily observed, and to hinder growth of trees and bushes▪ Control animals and fill burrows, holes, etc.▪ Repair rutting and potholes along crest
Inspections	<ul style="list-style-type: none">▪ Have dam inspected by registered Professional Engineer no less than once every 10 years▪ Report inspection results to DCR Office of Dam Safety▪ Have Town personnel perform annual inspections*

* A blank inspection form is provided.

The report includes 40 photographs of the buildings. Recommendations were made for repairs and improvements to the cottage.

Vernal Pool Investigations and Certification (2006)

On April 2 and 9, 2006, Tom Brownrigg (former Carlisle Conservation Commission member) and other observers investigated potential vernal pools on the Greenough property. In January, 2007, he submitted his findings for two pools (#s 1 and 2) to the Natural Heritage and Endangered Species Program (NHESP) asking for vernal pool certification. Vernal pool #1 is approximately 400 feet east of the intersection of Brook and Maple Streets. Vernal Pool #2 is approximately 600 feet southeast of the same intersection. Vernal pool #1 was hydrologically connected to a wetland to the south, and NHESP decided to consider this a separate pool. Thus, NHESP's certification letter of March, 30, 2007 lists three certified pools. Details of the pool numbers, locations, approximate dimensions, and species found are provided in **Table 4-3**.

Table 4-3. Certified Vernal Pools on the Greenough Land

Number Assigned by:		GPS Location:		Pool Dimensions:		Depth*	Species Found (egg masses)
Brownrigg	NHESP	Latitude	Longitude	Length	Width		
1(a)	4396	42.5337	71.3169	500' N/S	200' E/W	10-12"	Wood frog Spotted salamander
1(b)	4397	42.5337	71.3169	250' N/S	70' E/W	10-12"	Wood Frog Spotted salamander
2	4398	42.5326	71.3153	100'	100'	10-12"	Wood frog

* Depth where egg masses found

Note: Observation dates for all pools were April 2 and 9, 2006.

State-Listed Rare Species (Natural Heritage and Endangered Species Program)

According to a June 2007 review by the Massachusetts Division of Fisheries and Wildlife², their data base indicates that the following State-listed rare species have been found in the vicinity of the Greenough Land (**Table 4-4**):

Table 4-4. State-Listed Rare Species Found Near the Greenough Land

Scientific Name	Common Name	Taxonomic Group	State Status	Last Year Observed*
<i>Glyptemys insculpta</i>	Wood Turtle	Reptile	Special Concern	2000
<i>Emydoidea blandingii</i>	Blanding's Turtle	Reptile	Threatened	2005
<i>Bolboschoenus fluviatilis</i>	River Bulrush	Plant	Special Concern	2002
<i>Viola brittoniana</i>	Britton's Violet	Plant	Threatened	2002

* These are dates from the State's data base and may be out-of-date. As noted in a subsection below, there have – for example – been more recent observations of Britton's Violet.

The State's BIOMAP (<http://maps.massgis.state.ma/BIOMAP/viewer.htm>) data base shows that much of the land around the Greenough Land is considered to be Supporting Natural Landscapes for rare species (see **Figure 4-1**). The Core Habitat for one of the Greenough Land's rare species is also shown (small round circle). The NHESP also provides maps for Priority and Estimated Habitats. For the Greenough Land area, the two Habitats cover the exact same area. The 2008 Priority and Estimated Habitat Areas are shown in **Figure 4-2**. Priority Habitats are not protected under the Massachusetts Endangered Species Act, but the rare species that use the habitats are protected by that law. Priority and Estimated Habitats are defined in NHESP as follows (see: <http://mass.gov/mgis/wethab.htm> and <http://mass.gov/dfwele/dfw/nhesp/nhenvfaq/htm>):

2. Personal communication from the MA Division of Fisheries and Wildlife (NHESP Tracking #: 07-22459) to Warren Lyman, Carlisle Land Stewardship Committee, June 13, 2007.

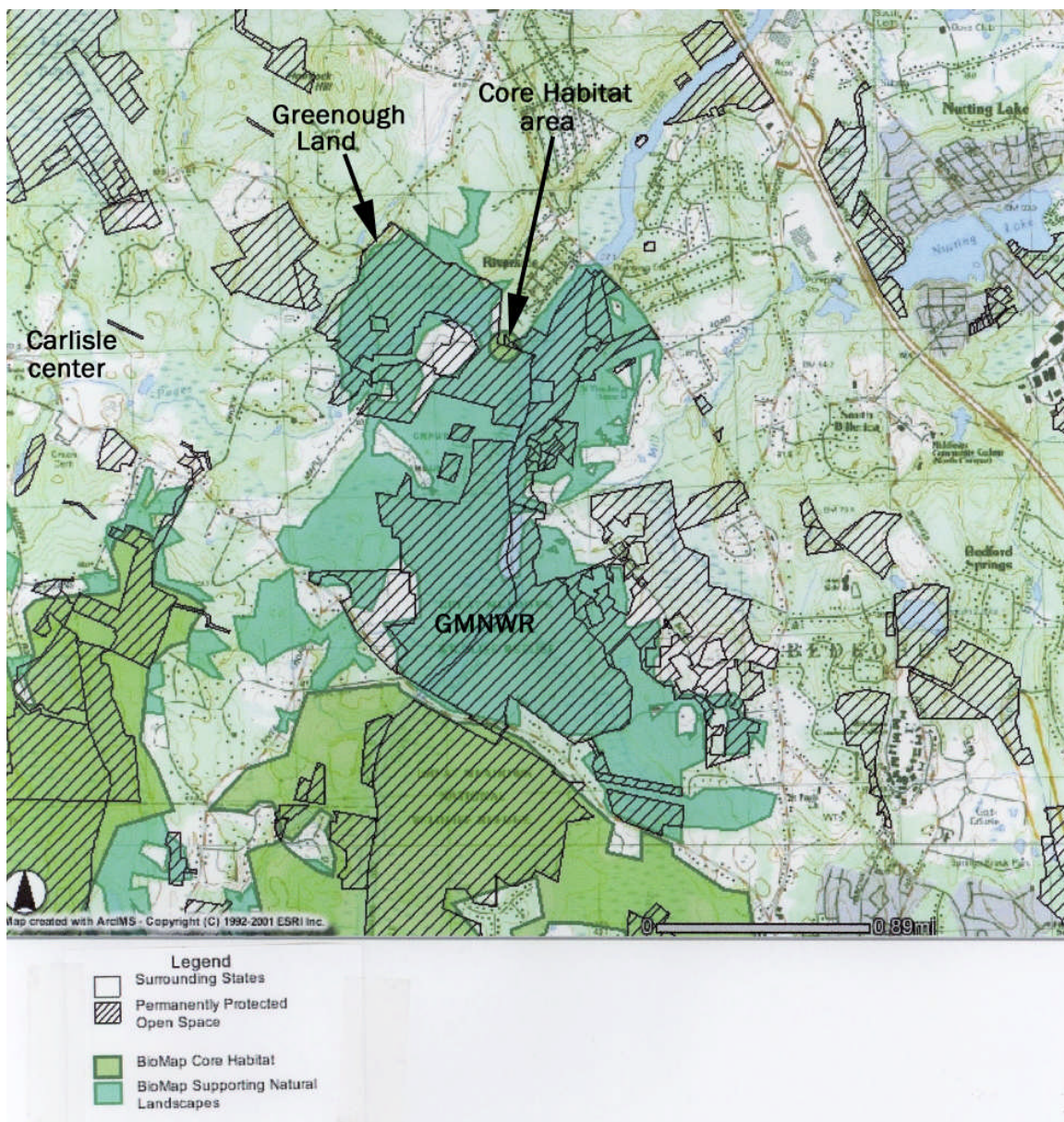


Figure 4-1. NHESP's BIOMAP for Eastern Carlisle



The green hatched area (yellow border) in the center of figure is part of NHESP's 2008 Priority Habitat of Rare Species and also Estimated Habitats of Rare Wildlife. The Greenough Land is approximately centered on Greenough Pond. This NHESP figure was issued October 1, 2008.

Figure 4-2. NHESP's Priority Habitat Area Near the Greenough Land

“The Wetlands Protection Act does not protect state-listed rare plants, but rare plants are protected pursuant to the MA Endangered Species Act (MESA compliance). Priority Habitat is the known geographical extent of habitat for all state-listed rare species, both plants and animals. Habitat alteration within Priority Habitats may result in a take of a state-listed species, and is subject to regulatory review by the Natural Heritage & Endangered Species Program (NHESP). Priority Habitat maps are used for determining whether or not a proposed project must be reviewed by the NHESP for MESA compliance.

Estimated Habitats are a sub-set of the Priority Habitats that show the geographical extent of state-listed rare wildlife (no plants). State listed wildlife species that use wetland habitats are protected under the Massachusetts Endangered Species Act as well as the Wetlands Protection Act.

The Estimated Habitats of Rare Wildlife datalayer consists of polygons representing estimations of the habitats of state-protected rare wildlife populations that occur in Resource Areas.³ These habitats are based on rare species records maintained in the NHESP’s database.

NHESP scientists draw estimated habitats by analyzing population records, species habitat requirements, available information about the landscape (particularly from topographic maps and wetland inventory maps), as well as through personal observations. Most habitat sites are not visited prior to the drawing of these Estimated Habitats. Estimated Habitats are not equivalent to Resource Area delineation. These Estimated Habitats are designed for use with the Wetlands Protection Act Regulations (310 CMR 10.00). Projects that are subject to the Wetlands Protection Act and that fall within Estimated Habitats of rare wildlife require the filing of a Notice of Intent form with NHESP.”

As noted in the quotation above, there is a regulatory aspect to the designation of an area as an Estimated Habitat.

Bird Lists for Greenough and GMNWR (Tom Brownrigg)

Tom Brownrigg, former Carlisle Conservation Commission member, is an avid birder who maintains a list of birds seen in Carlisle, by area or conservation parcel. The list of birds he has seen at the Greenough Land, and for the combined Greenough Land and O’Rourke portion of the Great Meadows National Wildlife Refuge (GMNWR), are provided in **Appendix E**. Two lists are actually provided, the first covering only the Greenough Land (106 species), and the second covering the combined Greenough Land and O’Rourke portion of the GMNWR (126 species). Record keeping started in April 1988 for the Greenough Land, and in June 2000 for the combined Greenough/GMNWR property.

3. The definition of “Resource Area” (Area Subject to Regulation) is included in the Wetlands Protection Act Regulations (310 CMR 10.02(1)).

Wood Duck Nesting Boxes and Monitoring (Mass Wildlife)

Mass Wildlife maintains over 1,600 wood duck nesting boxes in the State, and over 30 of these are on the Greenough Pond and upstream wetlands within the Greenough Land. Information on the boxes on the Greenough Land is provided in **Table 4-5**.

Table 4-5. Wood Duck Nesting Box Data for the Greenough Land

Time Period	Average Number of:			Average Percent of:	
	Nesting Boxes	Nests	Hatches	Boxes with Nests	Nests with Hatches
1979-1986	25	19	15	76	80
1987-2006	33	33	24	100	74

There does not appear to be a discernable time trend between the two time periods compared in Table 4-5 above. The boxes are usually checked twice a year (e.g., May and then after the nesting season). The Greenough wood duck nesting area is occasionally used by Mass Wildlife for special studies of the ducks.

Britton's Violet: Population Monitoring (Sally Zielinski)

As stated in the *Open Space and Recreation Plan: 2005*, Carlisle's best-known rare plant is *Viola brittoniana*, commonly called Britton's violet. It is a globally rare plant that grows on river flood plains. Britton's Violet was once abundant along the east coast from Maine to North Carolina, but today it is known at only seven locations. Six of these are in Massachusetts along a stretch of the Concord River, and one - rediscovered in the late 1980s by Mark Halloran - is on the Greenough Land.

Since that rediscovery, Dr. Sally Zielinski of Carlisle has been studying several Britton's Violet populations – including the Greenough one – under grants from the Nature Conservancy and the Massachusetts Natural Heritage and Endangered Species Program (NHESP). Her studies have included the biology and ecology of the plant, monitoring population levels, searching for additional populations, and developing management plans for the sites where the plant is declining or threatened with development.

In Massachusetts, according to a NHESP brochure, Britton's violet inhabits moist, sandy soils of river meadows and upper borders of open floodplain woods, generally with the habitat subject to at least occasional flooding. The plant flowers from mid-May to mid-June. Between 1989 and 1999, Dr. Zielinski reported the number of plants in the Carlisle population to range from 35 to 160.⁴ In 2001, Dr. Zielinski reported there were 224 plants in the Carlisle population.⁵ Surveys in 2002 and 2004 also found the Carlisle population. Copies of these reports are in the Conservation Commission files in Town Office. As of April 2007, the date of the next survey had not been set.

4. Sally A. Zielinski, "Population Studies of the Rare Species *Viola Brittoniana* Pollard in Massachusetts [1989-1999]."

5. *ibid.* : Report for 1998-2001.

Biodiversity Days (Visible Species) Data (Mass. EOEEA)

As part of its mission to reconnect people to the natural world and build public support for protecting biodiversity in our backyards, neighborhoods, communities and watersheds, Executive Office of Energy and Environmental Affairs (EOEEA) has created a database of information on Massachusetts biodiversity.⁶ This database serves as both a central repository of data from all 351 cities and towns and gives local users detailed information about their community and its surroundings. The "Visible Species of Massachusetts" database currently contains approximately 11,325 taxa (species and higher groups such as genera) that are known to occur in Massachusetts and 167,908 occurrences or sightings.

Inspection of database for Carlisle on 11-1-07 showed, under listings for either "Greenough" or "Greenough & GMNWR", approximately 44 bird species and 7 wildflowers. Most observations were from 2005 and 2007. It is expected that future Biodiversity Days events may focus on the Greenough Land.

Marsh Bird Study (Brian Tavernia, Tufts University)

In April 2008, Brian Tavernia, a graduate student at Tufts University, requested and obtained ConsCom approval to conduct a study of the effects of urbanization on marsh bird species richness using a portion of the Greenough Land. The study area focused on the wetlands west of Maple Street and may have included a portion of Pages Brook Reservation (owned by CCF). In addition to bird surveys, the study also included habitat composition, including invertebrate food sources, and habitat structure measurements. As of October 2008, study results were not available for inclusion in this document.

4.4 Plans for Abutting Conservation Lands

Carlisle Conservation Foundation – Billerica Reservation

The Carlisle Conservation Foundation (CCF) owns an 8-acre parcel in Billerica that abuts Carlisle's Greenough Land on the east, the border being the Carlisle-Billerica town line. This land was part of the original Greenough estate. The CCF has made a significant effort to manage this land and will eventually prepare a baseline assessment and management plan. This work is being led by Steve Hinton. At the time of this writing (December 2007), CCF had prepared a number of maps and had a survey (plan) of the land prepared. The survey was necessary as there was evidence of one or more encroachments by abutting private land owners. All Terrain Vehicles (ATVs) were also a problem on the site; signs were erected to inform the riders that this activity was not allowed.

6. Data base available at: <http://maps.massgis.state.ma.us/Biodiversity/BDResults.htm>.

Great Meadows National Wildlife Refuge

The most significant of the abutting conservation lands is the Great Meadows National Wildlife Refuge (GMNWR), managed by the US Fish and Wildlife Service (US Department of the Interior). The portion of the GMNWR in Carlisle (321 acres) is only a fraction of the whole GMNWR which consists of 3,600 acres – including significant freshwater wetlands – stretched along 12 miles of the Concord and Sudbury Rivers. The law requires the Fish and Wildlife Service to prepare Comprehensive Conservation Plans (CCP) for all of its refuges. The result of their efforts is the *Great Meadows National Wildlife Refuge – Final Comprehensive Conservation Plan: January 2005* (available at: http://library.fws.gov/ccps/greatmeadows_final05.pdf). The Plan, which became effective July 1, 2005, is based on the following five goals:

1. Recover threatened and endangered species of the complex.
2. Protect and enhance habitats that support self-sustaining populations of Federal trust species and wildlife diversity.
3. Build a public that understands, appreciates and supports refuge goals for wildlife.
4. Adequately protect cultural resources that occur in the complex.
5. Maintain a well-trained, diverse staff working productively towards a shared refuge vision.

The CCP will provide a framework for management that will last for 15 years. As necessary, specific regulations for allowed uses of the GMNRW will be issued and/or revised. According to a Fish and Wildlife Service summary, some of the highlights of the Plan include improved habitat management, opening or expanding hunting and fishing opportunities, and prohibiting dogs from the refuges. As in the past, other “non-wildlife dependent activities” including biking, horseback riding, dog sledding, snowmobiling and swimming are also not allowed. Entrance fees may be charged in the future. The ‘no-dogs’ regulations (excluding hunting dogs) are contained within the CCP. The details of the hunting regulations are published in the Code of Federal Regulations (50CFR32).

5. Maintenance and Current Condition of the Property

5.1 Maintenance

Buildings

Greenough Farm Buildings

Of the original Greenough farm buildings, only the barn remains as of December 2007. The cottage and greenhouse were demolished in late 2007, and the other buildings (e.g., hen and turkey coops) fell after years of abandonment. At the time of this writing (December 2007), the barn remains locked (most windows boarded) and unused while the Board of Selectmen seek a party interested in leasing the building. No routine maintenance is being provided. The Carlisle Department of Public Works occasionally checks the building.

Around 1998 – 2002, the Conservation Commission, acting through a special Greenough Subcommittee, undertook a major effort to find a lessee for the barn, cottage and agricultural fields on the Greenough land. The work involved the issuance of a Request for Proposals (RFP), and the evaluation of one or more resulting proposals. No suitable proposal was received following two separate RFPs. Later, in 2004, ConsCom looked for a tenant for the cottage. Professional inspections of the cottage indicated that substantial funds (> \$40,000) would be required to make the cottage habitable. Repairs would have required the removal of lead paint and asbestos, as well as major structural and roof repairs. For a few years prior to 2007, the barn had been used by Paul Booth in return for being a presence on site. In 1993, the Town spent \$6,350 to repair the barn's slate roof.

Skating Shed

The skating shed on the west side of Maple Street does not need, and does not receive, any regular maintenance. Trash is occasionally removed by a steward.

Parking Lots and Kiosk

The two Greenough parking lots are maintained, as needed, by the Carlisle Department of Public Works. This primarily involves snow plowing in the winter. The trash can at the northern parking lot is regularly emptied by a commercial trash hauler hired by the ConsCom. The kiosk at the northern parking lot is maintained by a steward.

Agricultural fields

The two small (linked) agricultural fields have, for many years, been licensed to local farmers who have used it to grow hay and, recently, corn (see Section 3.2). No further maintenance has been required. New three-year or five-year licenses were issued in 2008. Under the license, agricultural uses are controlled by the Town via a document entitled

“Exhibit A – Required Agricultural Practices” which is made a part of every Agricultural License Agreement.

Dam

The Greenough Pond dam has not been subject to any routine maintenance or inspection program. Past maintenance activities have been on an as needed basis. This has included adding fill to washed out areas or sinkholes on at least three occasions (1985, 1987 and 1996), and – thanks to a Trails Committee work crew – the removal of all large trees and bushes from the slopes of the dam in 2004. Some subsequent brush cutting on the dam banks has been carried out by the Department of Public Works. In 2006, the road on the dam was closed to motor vehicles due to failure of the spillways and the formation of sinkholes near the spillways. As mentioned in Section 4.3, the Town had a professional inspection of the dam conducted in October 2001. The resulting report contained detailed recommendations for the repair and maintenance of the dam (see Table 4-2).

According to Massachusetts regulations (32 CMR 10.07), the Greenough dam – rated as “Low” in hazard potential – must be inspected by a registered professional engineer at least every 10 years. There are minimum State requirements for such inspections. Since the State inspected the dam in 2000 (see Section 4-3), the next inspection must be by October 2011.

Trails, Trail Signs and Footbridge

Trails and trail signs on the Greenough Land are well maintained by the Trails Committee. The footbridge over the tongue of the Greenough Pond (in Billerica) had its last major repair in 1996; small repairs are more frequent. Replacement is being considered

Property Signs

Property signs are maintained by the Land Stewardship Committee. A few new signs will be added following a procurement (covering 7 conservation properties) initiated in late 2007. In November 2007, two signs were added in the area (near the north shore of Greenough Pond) where an illegal fire pit was found. One at the fire pit site is shown in **Figure 5-1**. The other – placed to be seen by people entering from Billerica – was a standard property sign listing prohibited activities, including fires without a permit.

Emergency Vehicle Access on Old Cart Path

In November 2007, the Land Stewardship Committee recommended to the Conservation Commission that the old cart path leading from the intersection of Brook and Maple Streets eastward to Greenough Pond (and extending almost to the Billerica Border) be brush cut to allow emergency vehicles to access the area of the illegal fire pit recently found. This action had been recommended by the State’s District Fire Warden who had

visited the site. A recommendation was also made to replace the large rocks at the Maple Street trailhead with a locked gate. The actions are under consideration.



Figure 5-1. Sign Placed at Location of Illegal Fire Pit

Wood Duck Nesting Boxes

As described in Section 4-3, the wood duck nesting boxes in the Greenough Pond and upstream wetlands are maintained by MassWildlife, part of the State's Division of Fisheries and Wildlife. The leader of this effort (as of 2007) was H. Heusmann in the Westboro office of the Division of Fisheries and Wildlife.

528 Maple St. Power Line Understory

The electric power lines serving the Nosowitz residence at 528 Maple St. (former Greenough house) come in from Maple Street on the north side of Page's Brook and head eastward – mostly following a trail – to the narrow point in the brook where Page's mill used to be. There, the lines take a right-angle turn to the south, cross the brook, and connect with the 528 Maple St. residence. It is presumed that the power lines, and the associated poles, were in place at the time the Town purchased the property. Clearing the trees near and under these power lines is important to reduce the likelihood of a tree falling on (and breaking) the lines, or causing an electrical interruption. Fallen – or shorted out - power lines also constitute a danger of forest fires and electrocution. When problems are known to exist, the power company is usually called to come and remove the trees posing a risk. A significant amount of preventive tree cutting, and the removal of at least one tree leaning on the wires, was undertaken in 2007. The Town is not informed any such work by the power company. A review of the Greenough Land records did not uncover any easement for this power line.

Forests

No maintenance is currently undertaken. This includes the pine plantation in the southwest corner of the property. Several years ago, the Conservation Commission looked into the possibility of woodlot management and timber harvesting and concluded that the lack of existing forest harvesting roads was a major problem. Without such roads, the economics of harvesting are not favorable. Building such roads would involve significant environmental damage.

5.2 Current Condition of the Property

Parking Lots and Entrance Roads to Them

The parking lots and entrance roads (all dirt) are in reasonably good condition except for the south lot where some grading of the entrance road is needed.

Emergency Vehicle Access

At present there is insufficient emergency vehicle access to the interior of the Greenough Land, important mainly for the larger portion between Maple Street and the Concord River. Emergency vehicles can enter the private driveway to 528 Maple Street, and can proceed as far as the dam. The dam is currently closed to motorized vehicles due to sinkholes, erosion and spillway failure. Emergency vehicles can get to the Greenough barn and the eastern side of the dam by entering from Riveredge Rd. (off Rt. 4) in Billerica. An old cart path leading from the intersection of Brook and Maple Streets to Greenough Pond is not wide enough to allow emergency vehicle access. Furthermore the trailhead is blocked by large rocks.

Property Signs

The property signs are in good condition. A few new signs stating allowed uses (12" x 18", aluminum) will be added in 2008. A property sign at the Billerica entrance (from Riveredge Rd.) is planned. This will be a joint effort with the Carlisle Conservation Foundation.

Buildings

Barn

The Greenough barn is in fair condition, but deteriorating. The basic structure is sound, but water has found a few locations to enter, including through the cupola and some windows. Many doors and windows need fixing, and – if the building is to be used – electric, heat, water and other utilities would have to be upgraded. The interior of the barn has been mostly cleaned out of large and/or hazardous items and materials. Nevertheless, some trash remains. The lack of a tenant has left the barn open to vandalism (e.g., broken

windows and doors, and spray paint on the interior and exterior). The Selectmen are currently looking for a use for the barn.

Skating Hut

The skating hut on the west side of Maple St. is in fairly good condition, but with evidence of some vandalism. Trash (beer cans and food containers) are often found there. There is no trash can at the nearby south parking lot.

Trails, Trail Signs, and Footbridge

The trails and trail signs are, with few exceptions, in good condition. Trail signage is considered adequate. A few signs near the barn were vandalized with spray paint in late 2007 and are being repaired. Boardwalks exist in the wetter trail spots to assist hikers. The Trails Committee has initiated plans to repair or replace the footbridge over the eastern tongue of Greenough Pond in Billerica.

In a few locations, unofficial trails have been made by visitors. One near the north parking lot is – based on trash left at the site and other observations - apparently for inappropriate uses. Efforts are made to discourage the use of such unofficial trails. The parking lot is frequently checked by the Police Department to further control the problem.

Dam

The condition of the dam was described in detail in the Stephens Associates *Report of Dam Engineering: Greenough Pond Dam*, submitted to the Town in September 2004. They specifically noted that the two spillways were in fair to poor condition. Furthermore, in 2000, an inspection by the State Office of Dam Safety resulted in a finding that the dam "...appears to be in fair to poor condition and not satisfactorily maintained. ... Furthermore, your spillway discharge capacity under the State's standard test flood appears to be inadequate and/or your outlet capacity is less than the estimated flow rate." (These reports were discussed in Section 4-3 above.) No changes have been made to the dam since these reports that would improve the condition of the dam except for the removal of trees and large bushes from the earthen banks of the dam. The center support of one cement culvert has disintegrated and the sides are eroding. The grooves in the cement spillway designed to hold sluice boards is partially deteriorated so it is no longer possible to insert boards to increase the water level in the Pond. In recent times, bank erosion and sinkhole formation (near the spillways) continue to be an issue. Because of the above, the road over the dam is considered to be unsafe for motor vehicles and is, thus, closed to such.

Agricultural Fields

The Greenough agricultural fields, currently licensed to local farmer Mark Duffy, appear to be in good condition.

Greenough Pond

No assessment has been made of the ‘condition’ of the pond, including such assessments as its water chemistry, eutrophication status, habitat value and recreational value. As noted in Section 1, the pond is very shallow (average depth of 2.1 feet), which is not sufficient for many fish. During a drought in 2007, a significant portion of the pond’s sediments were exposed to the air, and duckweed was thick in many areas. Over the past several years, there have been reports of fish kills in some summers.

Wood Duck Nesting Boxes

No assessment was made of the condition of the wood duck nesting boxes as this is routinely done by MassWildlife. Nevertheless, it is evident that time, weather conditions (e.g., wind, water, ice), and likely animals have led to significant deterioration of many of the boxes. The remnants of broken boxes are often found at the water’s edge.

Woodlands and Wetlands

Pine Plantations

No assessment of the condition of the pine plantations (tree farm) in the southwest corner of the Greenough Land has been made. An assessment would be required if woodland management (harvesting or removal of old trees) were to be considered. The red and white pines, presumably, were planted sometime after 1937. (Agricultural land was seen in aerial photos taken in 1937. See Figure 3-2.) The tree diameters currently are approximately 6" - 18" and 12" - 24" for the red and white pines, respectively.

Other Woodlands and Wetlands

No assessment has been made of the other woodlands or wetlands on the Greenough Land beyond the limited studies mentioned in Section 4.

Photographic Record

Appendix F contains a number of photographs of the Greenough Land, and associated buildings, trails and signs. Most were taken in March 2007. A number of older photographs of the property are available in Town Office files, including those related to the appraisals and purchase in 1971-1973, those related to the Minty property inspection in 2004, and others (in a leather binder) from the mid to late ‘90s (28 color photos). The photographs in Appendix F are thumbnail size; full-size electronic copies have been recorded on a disc and copies placed in Town Hall files. (See also the following subsection regarding photographs of portions of the Greenough Land boundaries.)

Inspection of Greenough Land Boundary

A partial inspection of the Greenough Land boundaries was undertaken in March 2008. The focus was on non-flooded boundaries between the Greenough Land and private residential areas, although portions of the boundaries with the GMNWR and Carlisle Conservation Foundation's (CCF) Billerica Land also were inspected. Some areas near the Concord River were flooded and could not be inspected. Carlisle's Conservation Restriction Advisory Committee (CRAC) periodically inspects the Workum CR (CR #30), so the boundary with that parcel was not inspected. Detailed information on the boundaries inspected is provided in **Appendix G**. Reduced-size photographs of selected boundary areas are also provided there as well as a map showing where the photographs were taken. Full-sized versions of the photographs have been placed on the disc mentioned in the subsection above.

A good fraction of the inspected boundaries (excluding those along roads) do follow old stone walls, wire fences, or ditches. This includes the western half of the northern boundary (the boundary with the Queensland residential area), the western portion of the southern boundary with the GMNWR, some eastern portions of the boundary with the GMNWR, a significant portion of the boundary with CCF land (stone wall much deteriorated), and the western portion of the southwest trending boundary starting next to 446 Brook St. Although these walls, fences and ditches help define portions of the boundary, they are commonly in poor condition and lack, with few exceptions, any purposely-placed boundary markers (e.g., stone pillars, iron pipes). Amongst the exceptions are a stone column marking the Carlisle-Billerica border on the western portion of the land (see photos 13 and 14 in Appendix G), an iron rod (photo 9) and stone marker (photo 12) on the northern boundary, and GMNWR signs at important points along its border with Greenough (see, e.g., photo 23). A number of boundaries with residential areas have no readily apparent markers, walls, fences or ditches. Examples include the eastern half of the northern boundary with Queensland, the four private residences on the east side of Maple St. that were carved out of the Greenough estate at the time of its sale to Carlisle (454, 528, 536 and 578 Maple St.), and also 491 Maple St. This latter property, according to a 1931 Plan of Land, had at that time a "large stone" marking the boundary with the Greenough Land near Maple St. As shown in photo 37, it is no longer there.

The only evidence of encroachment seen was a modest amount of disposal of lawn rakings from 846 Maple St. and perhaps one or two other residence in Queensland (see photos 3 and 4 in Appendix G). In addition, two old bicycles had been placed on the Greenough side of the border with the GMNWR in the area near the old O'Rourke home (photo 27).

6.0 Problems and Issues to be Addressed in the Management Planning Process

6.1 Introduction

The baseline assessment of the Greenough Land condition resulted in identification of a number of problems and issues to be addressed the forthcoming management plan. Recommendations for management planning focus include the following:

- Buildings: Greenough barn and skating shed
- Parking lots, entrance roads and kiosk
- Emergency vehicle access
- Greenough Pond dam
- Trails, trail signs and footbridge
- Agricultural fields
- Property signs
- Stone walls and gates
- Forest and understory management
- Certified vernal pools
- Prevention of illegal activities (e.g., fires, building vandalism, unofficial trails)
- Native American Stone Features
- Encroachments by abutters
- Studies and outreach to promote appreciation of this large but little-used property
 - Historical use research of property
 - Wildlife inventory
 - Special study of Greenough Pond
 - Addition of interpretive signs and walks
 - Publications oriented to Carlisle citizens
- Coordinate plans with owners of abutting conservation lands

It should be noted that this is an initial list; it is possible that additional areas may be identified as the Land Stewardship Committee (LSC) gathers input on the baseline assessment and the management planning process from reviewers. It would also be useful to prioritize the list, based on inputs and LSC expertise, prior to developing the management plan.

6.2 Discussion of Specific Issues

Buildings

Barn

Although responsibility for management of the barn was transferred from ConsCom to the Selectmen in 2004, the ConsCom and the Land Stewardship Committee retain partial

responsibility to keep a watchful eye on the currently vacant property and to assist the Selectmen in finding an individual who will undertake maintenance, or direct the Town to undertake needed maintenance.

Skating Shed

A program of routine inspection and clean-up is probably all that is needed. Because of the lack of any regular use of the shed (certainly none for skating), it may be worth considering moving the shed to a more useful location.

Parking Lots, Entrance Roads and Kiosk

The two existing parking lots and associated entrances will only require periodic checking and maintenance similar to what is currently provided. Adding a trash can to the southern parking lot (the northern lot has one) should be considered, especially given the party trash that often ends up at the nearby skating shed.

Consideration should be given to adding a third vehicular entrance and parking lot using the access from Riveredge Rd. in Billerica. This would require obtaining approval from the Carlisle Conservation Foundation (CCF), whose land would have to be traversed, as well as the Conservation Commission. The new parking area could be placed in the area of the recently-demolished cottage. A major benefit of this new vehicular entrance would be increased recreational use of Greenough Pond for canoeing, fishing and skating. In addition, such an entrance could be considered a handicapped access point for this recreational resource.

Emergency Vehicle Access

At present (May 2008), ConsCom is considering a request from the LSC to brush cut the edges of an old cart path so that emergency vehicles could travel from Maple Street to the interior of the Greenough Land where a fire pit has been found. An evaluation should be made as to whether or not emergency vehicles could pass over the Greenough dam road, currently closed to motor vehicles.

Greenough Pond Dam

For the pond and dam, the future management planning might consider different levels of “management”, e.g.: (1) do nothing except to maintain a trail over the earthen dam; (2) try to maintain the pond and dam in their present condition (without major repairs); and (3) repair the dam to restore it and the pond to their original condition (while also increasing the safety and capacity of the spillways). Option 1 could eventually lead to a failure of the dam and a loss of most of the storage capacity of the pond, which would revert to a wetland. Option 2 might differ from option 1 by including, as needed, minor repairs on the spillways, and tree and brush removal from the banks of the dam.

If option 3 (which includes repairs) was chosen, a very specific management plan should be prepared along the lines suggested by Stephens Associates in their 2004 report to the Town (see Section 4-3 and Table 4-2). The plan would have to cover: (1) recommended repairs; (2) routine maintenance; and (3) both annual and the State-required, 10-year-interval inspections. For the inspections, the annual one can be done by the LSC using guidance provided by the Stephens Associates' report; the 10-year-interval inspection must be done by a certified professional engineer. A significant issue is the relatively large costs associated with the recommended repairs. Different funding sources will have to be investigated. It is hoped that most of the routine maintenance could be done by the Town (e.g., DPW, LSC and Trails Committee). This would include, as needed, filling in of wash-out areas and sinkholes, and cutting of trees and large bushes on the banks of the dam. If possible, the road across the dam should be sufficiently repaired so that motor vehicle traffic – at least for official and emergency vehicle use – is allowed.

If option 3 was chosen, it would be possible to return to the use of flashboards in the spillways – or to otherwise raise the pond water level to its original height – which should improve both the wildlife habitat and recreational values.

The management plan might consider actions that would improve the public's use and appreciation of the Pond. Uses that might be promoted include wildlife viewing, skating, fishing and canoeing.

To meet the state's requirement of a dam inspection every ten years, the next Greenough dam inspection will have to be conducted by October 2011. This must be done by a registered professional engineer.

Trails, Trail Signs and Footbridge

The Trails Committee routinely checks these items and undertakes maintenance and improvements as needed. The Trails Committee has initiated plans to repair or replace the footbridge over the eastern tongue of Greenough Pond in Billerica. No other specific recommendations for future changes or improvements have been developed. Assistance in discouraging the use of unauthorized trails would be appreciated.

Agricultural Fields

Licensing of the Greenough fields is currently managed by the Conservation Administrator. The 3-year license is up for renewal in 2008. A new 3- or 5-year license will be awarded. No specific recommendations have been developed for any changes in the allowed agricultural use of the land.

Property Signs

The new signs to be added in 2008 (purchased with Community Preservation Act funds) should insure good coverage for this property. This will include a large sign at the

entrance from Riveredge Rd. in Billerica. Additional signs may be needed if and when the barn finds a tenant, or if illegal activities warrant special signs.

Stone Walls and Gates

There are numerous stone walls on the Greenough Land, although their locations have not been documented. At some point they should be all located, mapped and occasionally inspected to guard against loss or vandalism. A gate has been proposed for the trailhead at the intersection of Maple and Brook Streets. Large rocks currently block the trailhead.

Forest and Understory Management

Pine Plantation

The *de facto* decision for the last 35 years of Town ownership of the plantation has been to do nothing in the way of management or harvesting. The consequences of this choice need to be understood, as do the pros and cons of more active management. As indicated in Section 5, the lack of existing forest harvesting roads was considered a major impediment to traditional (mechanized) harvesting methods. Any forest management activity would need to be undertaken under a forest management plan that had been reviewed by the Natural Heritage and Endangered Species Program.

Other Forest and Understory Areas

No specific suggestions are presented for other forest areas or understory areas. However, management for habitat improvement or removal of invasive species are possible goals.

Certified Vernal Pools

Periodic inspection of the three certified pools is probably all that is necessary to insure that they are not being altered or disturbed by human activity.

Prevention of Illegal Activities

Illegal or unwanted activities include fire pits (campfires), making unauthorized trails, using the property for sexual encounters, littering, building vandalism (barn and skating shed), use of dirt bikes, and discharge of firearms. On both Greenough and the abutting CCF's Billerica reservation, ATVs have been a problem. Ways to control such problems will have to be addressed.

Encroachments by Abutters

An inspection of the Greenough boundaries in March 2008 (focusing on boundaries with private land owners), found a small amount of encroachment, in the form of lawn rakings disposal, from one or two abutters in the Queensland residential area on the northern Greenough border. The area should be checked regularly.

Another area that needs to be checked is the fenced horse enclosure at 528 Maple St. which, at times, appears to encroach (with temporary fencing) on the Town-owned land. In addition, it would be best if a formal agreement was reached with the owners of the 528 Maple St. property regarding any clearing of the power line understory – on Town-owned land – which leads to their home.

There have been some reports of deer hunting from vantage points beyond the property.

Native American Stone Features

There are no clear threats to the stone features (described in Section 3.1) and possible sensitive areas but they should be kept in mind if any work is to be done on the land. For example, if tree clearing or logging is carried out on the southern tree plantation, as has been discussed from time to time, it probably should be preceded by an assessment by the archaeological and Indian communities. A more detailed survey of features is ongoing. The northwestern portions of the land have been covered reasonably thoroughly and the northeastern part less thoroughly. The area between the fields and the river has not been examined recently but during walking tours nothing was seen. It probably should be examined.

Environmental Studies

Because of the physiographic diversity of the Greenough Land, it should be a fruitful place to conduct studies of habitats, flora & fauna, ecosystems and invasive species. A special evaluation for Greenough Pond would also be valuable. The results of such studies would not only provide greater appreciation of the property, but allow more informed management (including protection of vulnerable habitats or species) and also provide the information needed for outreach items such as publications, kiosk maps, and interpretive signs.

Coordinate Plans with Managers of Abutting Conservation Lands

One element of the Greenough Management Plan to be prepared should focus on communication and coordination with the managers of the abutting conservation lands: (1) the Carlisle Conservation Foundation; and (2) the U.S. Fish and Wildlife Service. Areas of cooperation include connecting trails, habitat and rare species protection, preventing illegal or improper use of the land, and outreach.